THE

AMERICAN JOURNAL

OF THE MEDICAL SCIENCES.

NOVEMBER, 1893.

ON SPORADIC CRETINISM IN AMERICA.[1]

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The studies which have given to the thyroid gland the dignity of an organ with diseases of capital importance have come from practising physicians, experimental physiologists, and from surgeons: studies which, "fitly joined together," have not only made clear some dark problems in pathology, but also have raised a reasonable hope in the treatment of a group of hitherto hopeless disorders.

A relation between myxœdema proper and cretinism was hinted at by Gull in the title of his paper (1873) "On a Cretinoid State Supervening in Adult Life in Women," and clearly appreciated by Ord, in 1877, in a fuller description of the disease, in which its connection with abnormal states of the thyroid gland was recognized. The remarkable cachexia found by the Swiss observers, Reverdin and Kocher, to follow certain cases of total extirpation of the thyroid, and the brilliant studies by which Horsley demonstrated the existence of an experimental myxœdema, threw a flood of light on the whole subject, and enabled the committee of the Clinical Society of London, in 1888, to reach the following conclusions: "That there is strong evidence that myxœdema, sporadic cretinism, endemic cretinism, cachexia strumipriva, and the operative myxœdema of animals are severally species of one genus; that such clinical differences as exist between them are due to causes already

[1] Read before the Association of American Physicians, May, 1893.

sufficiently set forth; and that the one pathological fact common to all these conditions is the occurrence of morbid processes or of operations involving the annihilation of the function of the thyroid body."[1]

Having had at my clinic within a comparatively short space of time three cases of cretinism, and knowing that the subject of myxœdema was to be presented at this meeting, I thought the matter of sufficient interest to inquire as to the prevalence of the disease in this country. The report here made is based upon a careful search of the literature so far as it relates to the United States and Canada, and upon inquiries made of the superintendents of the Asylums for the Insane and of Institutions for Feeble-minded Children throughout the country, as well as of many friends.

As much misunderstanding exists as to the exact definition of a cretin, illustrated by the fact that at least one-half of the photographs sent me from different institutions did not belong to this type of idiocy, it may be well to define somewhat carefully the precise conditions to which this term should be applied. In the first place, there is no essential difference between the cases occurring in large numbers in goitrous districts and the sporadic cases. The term should be limited accurately to a form of idiocy associated with changes in or absence of the thyroid gland. The following statements are based upon the recent article of Horsley.[2] The important factor is the loss of the function of the thyroid gland, whether this results from congenital defect, progressive atrophy, or coarse changes which gradually annul its function.

1. *Congenital cretinism* is rare, and is usually associated with absence of the thyroid gland. The child rarely lives, but the changes presented are sufficiently distinctive for diagnosis. The supra-clavicular fatty tumors are well marked and the skin generally is thick and in folds. The limbs are short, the epiphyses swollen, while the shafts are much ossified. The skull is broad and short, the sutures open, and the basi-sphenoid junction is prematurely ossified, a point upon which Virchow laid great stress. This congenital variety may be difficult to distinguish from rickets. Degenerative changes, slow over-growth of the fibrous tissue, and a myxœdematous condition have also been met with.

2. *Ante-natal and subsequent slow development of cretinism.* Here the changes appear to have been initiated during fœtal life, but are slight and scarcely noticeable at birth. "The infant shows no, or very slight, signs of intelligence, but the physical signs are less obvious. According to some, the majority at birth have a goitre, usually of about an inch in diameter; the body is large, with disproportionate head and hands, and, what is more important still in connection with the similarity

[1] Report of a Committee of the Clinical Society of London, to investigate the subject of Myxœdema. Clinical Society's Transactions, Supplement to vol. xxi. p. 199. London, 1888.

[2] Tuke's Dictionary of Psychological Medicine: art. "Cretinism."

to myxœdema, in many cases the subcutaneous tissues appear œdematous; occasionally, according to the severity of the case, there is also non-development of the facial bones, a flattened nose, giving a stupid appearance, and a large thick tongue. The neck is short and thick. It is obvious that under these circumstances we have the same condition as that described above, only much less severe; the further history of these cases shows that the destruction of the thyroid gland continues, and the symptoms develop into the worst form of cretinism, about to be described." (Horsley.)

3. *Development of cretinism in early childhood.* The infant may be perfectly normal at birth, develop naturally, and show no signs of disease until from the second to the fifth year. A majority of the instances of sporadic cretinism belong to this division. "The child from being bright and normal becomes gradually less and less intelligent, and at the same time the physical appearances which have been summed up in the conditions before mentioned begin to assert themselves. The child does not increase in height, the limbs similarly do not lengthen, but remain short and thick. The trunk is broad and thick, there being also well-marked lordosis, so that the abdomen is prominent. In like manner the neck is shortened, the skull broad, the nose *retroussé*, the lips thick, and the teeth very imperfectly developed. The speech, from being clear becomes thick, the voice is rough and at times stridulous, the physiognomy is placid to stupidity, the skin is coarse, the hair becomes scanty and thin. There is well-marked anæmia; the subcutaneous tissues have a peculiar kind of spongy or waxy feel, as if there were, so to speak, solid œdema occupying the connective fibres of the tissues.

"The condition thus produced reaches its height usually by the end of fourteen or fifteen years, so that by the twentieth or twenty-first year it has attained complete development, and thenceforward remains perfectly stationary until death. Hence, at the age of thirty the physical appearance presented is that of a young child, and the intellectual condition similarly does not advance beyond that of childhood." (Horsley.) A majority of the cases of which I shall speak and which are illustrated in this paper belong in this division.

The adult condition of cretinism as seen in cases which have developed slowly, and have reached the age between twenty or thirty and over, is very characteristic. This "pariah of Nature," as it has been called, is a being degenerate both physically and intellectually; short in stature and childish in appearance. The height usually does not exceed that of a child from five to seven years old. The skin is often rough, sometimes brown and stained, but in the sporadic cases more frequently of a chalky earthy hue. In certain instances the subcutaneous tissues are much infiltrated, so that the skin has a curiously waxy

hue. Supra-clavicular folds of a fatty and myxœdematous character are common. The hair may be thick, and is usually confined to the head, even in adults; but in some instances there are traces in the axillæ and on the pubes. The face has an aspect of dulness and stupidity, though sometimes in the sporadic cases it is bright and smiling. The lips are broad and thick and prominent; the nose is broad at the base; the nostrils wide; the alæ very broad and pass without any special division into the naso-labial fold. The eyes are widely separated and sometimes present strabismus. The eyelids are often œdematous. In advanced cases, though they see things, yet they see without any intelligence, and the expression of the eyes adds very much to the impassive, immobile aspect. The tongue is often thick, large, and may constantly protrude from the mouth. The skull is large in proportion to the body and to the face. It is broad, brachycephalic, the transverse diameter approaching that of the antero-posterior. It is flattened in the forehead and frequently depressed and sloping backward. The two halves of the head are often asymmetrical. The sutures are often occupied by Wormian bones. The neck is large and short, and the thyroid gland may be enlarged or may be completely absent. The thorax is usually deformed in association with lateral or antero-posterior curvature of the spine. The abdomen is prominent and full. The limbs are extremely short, sometimes emaciated, occasionally deformed by rickets. The muscles are feeble, the hands and feet are large, the fingers thick and broad, and the nails often coarse and large, and may be rudimentary.

There are varying grades of cretinism, and just as we recognize complete idiocy, imbecility, and feeble-mindedness, so there have been described three degrees of this affection: cretins, which present in a most advanced degree the physical characteristics above mentioned, and are in addition deaf-mutes with the vegetative functions alone active; semi-cretins, with mental duless, harsh guttural voice, expressionless countenance, and the physical condition similar to but less pronounced than that of the true cretin; and lastly, the cretinoid condition in which there is some degree of enfeeblement of the intelligence, speech somewhat impaired, and the physiognomy and physical conformation is that of the cretin.

The recognition of the condition of cretinism, though easy in advanced and typical cases, is often, I find, not clearly made: I judge this from the number of descriptive cases sent to me as instances of this condition, but which in reality have been cases of various forms of idiocy. The important criteria are the physiognomy, the shape of the head, the stunted growth, and the condition of the connective tissues. The mental deficiency is less characteristic, presenting nothing not seen in instances of ordinary idiocy. The condition of the thyroid is uncertain. There

are cretins with and cretins without goitre, while in others the gland seems entirely absent. The most satisfactory diagnostic feature is the condition of the skin and connective tissues, which, as Horsley suggests in the following words, should form really the basis of the classification. "By excluding all cases in which the appearance of idiocy is not accompanied by any noteworthy changes in the skin or connective tissues we obtain a considerable delimitation of the condition which we ought to call cretinism, for by adopting such a plan of differentiation we necessarily leave out all cases due to direct injury or disease of the central nervous system, and which are included in the conditions classed by various writers under different headings, such as congenital idiocy, idiocy following encephalitis, idiocy coupled with porencephaly, etc., all being cases where we have destructive lesions or non-development of the central nervous system, especially of the cerebral hemispheres, and in which, therefore, we have a simple and direct destruction of the intellectual mechanism. Although such conditions may be naturally accompanied by want of development in the parts of the body which may happen to be paralyzed, etc., still there is no direct or certainly no general change in the connective tissues throughout the whole system, and secondarily in the nervous system, such as furnishes the basis of the present classification."

The pathology of the disease requires to be studied in the light of the more recent researches. In endemic cretinism the thyroid gland is very commonly enlarged, but in all probability functionless, and the intimate relation of the condition to goitre, particularly the marked influence of heredity as shown in the fact that goitrous parents are more likely to have cretinous children, shows the close interdependence of cretinism upon conditions of the thyroid. In the sporadic cases the thyroid is usually absent, and in all probability the progressive changes in the connective tissues, including the bones, are associated in some way with the absence of the function of this gland.

HISTORICAL.—References to the existence of cretinism in America are found in Hirsch,[1] the *Dictionnaire Encyclopédique*[2] *des Sciences Médicales*, the *Nouveau Dictionnaire*, in the *Index-Catalogue of the Surgeon-General's Library*, and in the *Index Medicus*. Hirsch states that "Cretinism does not appear to be at all common except at a few points in all this region; at any rate it is stated by Barton that cases of it are rarely met with in the United States. Brown speaks of its occurrence in the valleys of Vermont; in Kneeland's account of the health of Massachusetts (for which State I have been able to learn nothing of the occurrence of goitre), it is stated that there are at least twelve hundred idiots and

[1] Handbook of Geographical and Histological Pathology, vol. ii. (New Sydenham Society's translation).

[2] Art. "Crétinisme," by Baillanger and Kreishaber.

cretins in a population of about one million. Praslow also has observed somewhat frequent cases of cretinism among a tribe of Indians living near Cape Mendocino, in California, as well as among the Spaniards in the mountainous parts of Southern California." These statements of Hirsch pass current in various works; thus Bury, one of the latest writers on the subject, in the *Cyclopædia of the Diseases of Children*,[1] says: "In North America cretinism is not common except at a few points, namely, in the valleys of Vermont, in Massachusetts, and in California." When we turn to the original sources for these statements, nearly all of which antedate 1850, we find, for example, the authority for the occurrence of the affection in Massachusetts the general statement of Kneeland,[2] that there are twelve hundred idiots and cretins in a population of one million. I can find no detailed observation in this article, and the term 'cretin' was probably used in a loose way to indicate some variety of imbecility. So far as I can ascertain, the statements as to the existence of the disease in Vermont and New Hampshire rest on a paragraph in Buckminster Brown's article on cretins in Switzerland:[3] 'Simpletons or idiots are to be met with in the valleys of Vermont, New Hampshire, or Scotland.' There is no reference to cretinism in Dorr's[4] account of the prevalence of goitre in the valleys of the Green Mountains. Trask, of Windsor, Vermont, speaking of the prevalence of goitre among the early settlers in the valleys, says: "In most countries goitre is connected with a species of mental imbecility called cretinism; but in the United States, thanks to God, it is a mere corporeal affection."

Praslow's account of the occurrence of cretins in California I have not seen, but I have letters from several correspondents in that State who know nothing of its existence at present, while in the State Insane Asylum, at Stockton, Dr. Hoisholt tells me, there are only two cases.

Barton,[5] whose essay on goitre, published in the year 1800, is one of the few systematic attempts to study the distribution of this disease in America, states: "I have heard of some cases of cretinism among the Indians inhabiting the neighborhood of Sandusky. But such cases are undoubtedly very rare in North America. This circumstance, as I have remarked, is well calculated to show that goitre and idiotism are not necessarily connected with each other."

Here and there one meets with the assertion that cretinism occurs in Lower Canada among the French, but I have not been able to trace the allusion to its source or to verify the fact of its existence. Some years

[1] Vol. ii., art. "Cretinism."

[2] AMERICAN JOURNAL OF THE MEDICAL SCIENCES, April, 1851.

[3] Ibid., 1847, ix. p. 111.

[4] New York Medical Depository, x.

[5] Benj. Smith Barton, Professor of Materia Medica in the University of Pennsylvania. "A Memoir Concerning the Goitre as it Prevails in Different Parts of North America." Pp. 93. Philadelphia, 1800.

ago I looked through two of the large institutions for children in Montreal, and the Longue Pointe Asylum, without finding any, and two cases supposed to be cretins, at Cacouna, proved to be remarkable rhachitic dwarfs.

The more recent literature descriptive of cases is also very scanty. Jacobi, in the *Hospital Gazette*, N. Y., 1879, vol. v., described briefly a case, the first on record in this country—a child of eight years. Johnson's paper, in the *Detroit Review of Medicine*, January, 1873, contains no statements about cretinism in America.

Last year two cases were reported; one by Lloyd,[1] from the Philadelphia Hospital; the other by C. W. Townsend,[2] of Boston. Huber, in the discussion on Townsend's case, stated that the disease was not very uncommon among the children "in the tenement districts of New York, owing to the influx of immigrants," but no definite data are available as to the facts of its prevalence.

ENDEMIC GOITRE.—Endemic cretinism occurs only in localities in which goitre prevails extensively, and the above observations, which have led in Europe to statements as to the prevalence of it here in endemic form, have been based in reality upon incidental references to, and studies upon, goitre, made for the most part in the early part of the century. So far as I can learn, the disease has not and does not occur endemically in this country. It may be interesting to note certain facts about goitre which I have gleaned in my inquiries, but which, however, refer to this malady only so far as it might be related to the existence of cretinism in a locality. Hirsch[3] is again our chief authority as to its prevalence; and, as he remarks: "Our information on the endemic occurrence of goitre in North America belongs for the most part to the early years of this century and is very fragmentary." Barton's memoir already referred to, and the articles of W. Gibson[4] and of Mease[5] contain the most authentic information as to its prevalence, from which subsequent writers have drawn their information. Without entering into details which are available in Hirsch's work, it may be stated that goitre has been described as prevailing among the French Canadians along the Detroit River, and along the Richelieu River between St. John and Montreal; in the valleys of Vermont and New Hampshire; in the central parts of New York about the smaller lakes; in Central Pennsylvania; in the mountainous districts of Maryland, Virginia, and the Carolinas; and in Alabama. From a majority of these localities we have no recent observations. I have written to a number of physicians in the towns of New England mentioned by Dorr[6] as very much

[1] International Clinics, vol. ii., series 2.
[2] Archives of Pædiatrics, Nov. 1892.
[3] Op. cit., p. 149.
[4] The Philadelphia Journal of the Medical and Physical Sciences, vol. i., 1820.
[5] American Medical Recorder, Philadelphia, 1818.
[6] New York Medical Repository, 1806.

affected, and so far have had only negative answers. Thus Dr. R. Clark, writing from Windsor, Vermont, one of the towns mentioned by the early writers, says that in the past fifty years he has not heard of its being very prevalent; and Dr. Emerson, who formerly practised at Chester, Vermont (a town one-half of the inhabitants of which were stated by Dorr [1806] to be subjects of goitre), writes that "During seven years' residence in Vermont I do not recall seeing more than three or four cases of goitre, and I do not think that it prevails to any special extent." Dr. R. J. Preston, of the Southwestern Lunatic Asylum, Marion, Virginia, has very kindly made inquiries as to the existence of the disease in some of the southwestern counties of that State, in which, as stated in Gibson's *Surgery*, the disease formerly prevailed, and here, too, it seems to have almost disappeared. Dr. W. Taylor, of Talladega, Alabama, who is the authority quoted by Hirsch in support of the statement that there is a "good deal of it" in the northern counties of that State, writes (1893): "Since that time [1854] my views on the subject have been greatly modified. With a much larger population there are now really fewer cases of goitre to be found in Talladega and adjacent counties than in the earlier period of their history . . . . The fact remains that there has been a great decrease in the prevalence of goitre during the past thirty years, and the percentage of cases will not surpass the average in other States and communities."

In the Province of Quebec cases of goitre are by no means rare, and in Montreal the disease is certainly more frequent in hospital practice than in Philadelphia or Baltimore. I have no information of any localities in which it could be said to be endemic, attacking a very large number of persons.

In the neighboring Province of Ontario, in the limestone regions at the end of Lake Ontario, the disease is very prevalent. In response to my inquiry about cretins, Dr. C. K. Clark, of the Kingston Asylum, mentions the extraordinary prevalence of the disease. Thus in an asylum population of about 600 there are 288 cases of goitre. He writes:

"The goitres are generally developed when the patients are admitted to the asylum, and it is rarely indeed that we see recent cases unless among the employés. After studying the subject carefully I have come to the conclusion that Eastern Ontario is a distinctly goitrous district, and I do not believe that outside practitioners have given the matter any attention. It is difficult to get accurate statistics even from asylums, and for this reason I have never published the returns sent in from nearly every hospital for the insane in America. A superintendent would answer my circular and state that his institution was without goitrous patients. I would go to his institution myself and probably find twenty or thirty goitres. The inference was plain, and when insti-

tutions side by side gave returns showing marked differences the inference was plainer still.

"Outside practitioners about Kingston have written nothing of interest in connection with the subject, but I find goitre prevalent even among the lower animals; most of the curs about the asylum have goitres, some of them so large that anyone can notice them. The tendency to this disease seems to run in certain strains, and the young of some families of dogs and horses are invariably goitrous. In two cases of human beings goitres have proved fatal through pressure. At one time I was inclined to believe that mental disease might be the factor determining the presence of goitre in so many of our people, but am now convinced that this alone will not account for the condition of affairs at the Kingston Asylum. The goitres met with in the insane are almost invariably incurable, probably because of long standing. Those occurring in employés are easily cured by ordinary methods of treatment. With some there seems to be a hazy idea that people coming from about Loughboro Lake have goitre more frequently than others in this district. There is nothing to show that such is the case, and the disease seems to be common and widespread throughout Eastern Ontario."

There are no cases of cretinism in the Kingston Asylum.

Altogether, the evidence at command favors the view that in the regions of Virginia, Alabama, and Vermont in which goitre was formerly endemic, it is now very rare.

Endemic cretinism does not exist, we may say, in the United States or Canada, nor is it at all probable, from what we can learn, that it has ever existed. My inquiries have not extended to Mexico, nor, indeed, to New Mexico, in which it is stated that both goitre and cretinism occur.

Sporadic Cretinism.—Independently altogether of the occurrence of endemic goitre, cases of cretinism are known to occur here and there in all civilized countries, and the inquiries which I have made in this country relate particularly to the existence of this form of the malady. Its rarity may be gathered from the fact that up to date, so far as I can ascertain, there have been but three cases put on record. My attention having been called to the subject by the appearance in rapid succession of three cases at the Johns Hopkins Hospital, I thought it would be of interest to the members of the Association, particularly in connection with the discussion upon myxœdema, to ascertain somewhat more accurately the prevalence of the disorder. Accordingly I sent out letters to all the asylum superintendents in the United States and Canada, and to the various institutions for feeble-minded and idiotic children, asking information as to the existence of the disease. I wrote also to physicians practising in various localities in which it had been stated that goitre prevailed endemically. Among the replies which I received

were descriptions of many cases of idiotic children which were evidently not cretins; but, in addition to the hospital cases I have referred to, there were eight well-characterized examples, the description of which will be given. In addition, from various superintendents there were statements as to the existence or occurrence of five or six other cases. The interest in the subject is at present a very practical one, inasmuch as the observations on the beneficial effects of thyroid feeding have been shown in several cases, particularly in those seen within the first three or four years of life. I have at present two cases under treatment, but both for such a short time that it is impossible to say as to the changes in the condition.

CASE I.—M., aged (now) two years and three months, was brought to me first from the Eastern Shore of Maryland, January 10, 1892. The parents (first cousins) are healthy and strong. No hereditary ailments on either side; no members of the family have had goitre. The patient was the second child; the labor was easy, and she throve well. Nothing special was noticed about the child until the end of the first year, when it was suspected something might be wrong, as she had not cut her teeth, and did not attempt to walk or to talk. Throughout her second year she grew fairly well, but had several attacks of slight fever, and did not develop as other children, making no attempts to crawl or to walk, and seemed unnaturally quiet and dull. She did not cut the incisor teeth until she was nearly two years old. Within the past six months she has changed remarkably in color, has become very pale and waxy, and the face and limbs seem puffy and swollen. She has taken milk well, and has developed a little mentally; smiles, and attempts to repeat her own name when it is said, and has learned to say "mamma" and "papa."

Present condition. Under-sized child for her age. Aspect is very striking; color, pale; face, very broad across; the mouth is open; tongue protrudes, and is evidently enlarged; the lips are full and heavy; the cheeks very large, almost pendulous; the hair is long and straight; the eyes are blue; the sclerotics very pale; the eyelids glossy and infiltrated. The forehead is large, not badly shaped; the head well formed, rather prominent behind; the anterior fontanelle is not quite closed. She looks good-tempered, but takes very little notice, and smiles in a feeble way. The facial aspect is that of a cretinoid idiot.

The muscles of the arms are feebly developed; the subcutaneous tissues are much infiltrated; the hands are swollen and glossy—not tense, and look œdematous, but the infiltration is firm, and only yields on prolonged pressure. The legs look large; the thighs present several folds; the skin looks glossy, and the subcutaneous tissues are much infiltrated. The skin over the dorsal portion of the feet is very glossy and tense, and on firm pressure pits with distinctness. The abdomen is distended and the superficial veins prominent. Palpation is negative; the edge of the liver is palpable about six cm. below the costal margin. The edge of the spleen is not palpable, nor does the organ appear to be enlarged. The thorax is well formed; no trace of rickety enlargement of the ends of the ribs; no evidences of

rickets in the long bones. The apex-beat of the heart is just within the nipple line. There is a systolic murmur with the first sound, which is loud and intense at the pulmonary cartilage; the breath sounds are clear. There is no enlargement of the superficial lymphatic glands; the thyroid gland is not enlarged; the cricoid cartilage can be well felt, as can also the entire trachea as low as the sternum, and it can be taken between the two fingers quite plainly. Dr. Halsted thought he could feel the thyroid beneath the sterno-mastoid muscle. The percussion note on the first bone of the sternum is clear. The examination of the blood showed a moderate increase of leucocytes and some irregularity in the size of the red blood-corpuscles.

The condition was diagnosticated as sporadic cretinism. As it was evident that the blood condition of the child was very much below par, she was ordered the syrup of the iodide of iron.

March 1, 1893. Patient brought again to-day. In the year and two months which have elapsed since I saw the child she has improved remarkably. She is now three-and-a-half years old. Her height is 75 cm. She looks more intelligent, takes more notice, and the facial expression is decidedly brighter. She tries to say a few words, and has begun to walk with a little assistance. The most striking changes are the disappearance in great part of the anæmia and lessening of the firm subcutaneous œdema which was so marked a feature. She still has a little infiltration about the eyelids and cheeks. The limbs also look full, and they are firm. The skin is a little glossy over the hands and feet. The tongue does not protrude so often from the mouth, though when the face is in repose it is frequently seen protruding slightly. The face looks broad and full, and the expression and aspect is still cretinoid; Head is 51.5 cm. in circumference, the abdomen 54.5 cm. The neck is thick and short, and presents a large transverse fold of fat. The thyroid gland is not palpable, and below the thyroid cartilage the trachea can be felt with the greatest distinctness and grasped between the fingers down to the sternum.

The favorable reports from cases of sporadic cretinism treated with the thyroid extract encouraged us to try it in this case, and the child has been taking the glycerin extract of the sheep's thyroid in an amount corresponding to about a quarter of a gland in the twenty-four hours. No special change is as yet noticed after nearly a month's treatment.

Case II.—Emma ——, aged nineteen years; brought to the Johns Hopkins Hospital by her mother, March 3, 1893. The family history is good; parents are not blood relations; no thyroid enlargement; no history of mental troubles. Patient is the second child; delivery was not instrumental; she was healthy when born; fat and well; nursed for nearly a year, and it was not until the end of this time that it was noticed that she was backward in development. She did not seem to grow and thrive as other children, though she took her food well, and was in other respects quite healthy. For several years it was thought that she was completely idiotic, as, though she took notice and seemed to know what was said to her, she did not walk or talk, but had to be held in the lap, and the tongue was constantly protruded from the mouth. She did not begin to cut her teeth until the third or fourth year. They decayed early and rapidly, and her second dentition did not begin until she was past her twelfth year. The anterior fontanelle did not close until after her eighth

year. She did not begin to walk until her twelfth year. She has never learned to read or to write.

Present condition. Her height is three feet nine inches. She walks readily; the feet are turned out a little, and there is a somewhat waddling, uncertain gait, with the hands spread. The face has the characteristics of a cretin. The expression is pleasant; she smiles brightly, and looks good-natured, but has a childish, somewhat silly expression. She sits quietly, as a rule, with her mouth shut, but sometimes the tongue protrudes between the lips. The face is broad, and all the features thick and coarse. The nose is *retroussé*, the nasal orifices very apparent, and the alæ thick, and measure across the margins fully 5 mm. in thickness. The lips are thick and full; the cheeks prominent, large, and broad. In the upper jaw the lateral incisors are absent; the central incisors are of fair size, the enamel much eroded; the canines are small, also with defective enamel. The premolars and molars are small and much decayed. In the lower jaw the teeth are all present, but they are irregular and show the same character of defect. The roof of the mouth is much vaulted, the palate is not defective. The forehead is full, a little prominent in front; the head is long; the occiput projects, and it is broad immediately behind the parietal eminences. The occipital arches are much developed, and there are thick ridge-like projections at the line of the squamo-parietal sutures. The circumference of the head is 54½ cm.; from the tip of one ear to the tip of the other, 27 cm.; from the occipital protuberance to the glabella, 38 cm. The ears are well formed.

The neck is 36 cm. in circumference. The thyroid gland is distinctly enlarged; the left lobe more than the right. The hands and arms are well formed; there is no enlargement of the epiphyses. She uses her fingers well, and can feed herself and pick up small objects, but the movements are somewhat clumsy, and she is unable to dress or undress herself. The legs are firm and strong; not bowed. The gait is as above mentioned; she falls easily, and, as her mother expressed it, has no elasticity. She is flat-footed. The knee-jerk seems slightly increased. The body looks squat and full; the thorax is capacious; the back shows a moderate antero-posterior curvature. The abdomen is large. Examination of the thoracic and abdominal organs negative.

She is well nourished, and the subcutaneous tissues are firm but do not pit, and there is no appearance like that of myxœdema; it is only in the thickness of the features that the condition is suggested.

She talks a great deal; the voice is high-pitched, very difficult to understand. Some words she speaks clearly, and she talks and behaves very much as a child of two or three years. She is easily amused; showed with great pleasure and childish joy a little new ring, and is very fond of pretty things. She has a very good musical ear; can sing several little songs. She is very good-hearted and generous, and always very anxious, if she has anything nice, that the servants, who are devoted to her, should share it. She is, however, self-willed, and does not like to be thwarted. She began to menstruate eighteen months ago.

CASE III. (Dr. Booker.)—Minnie R., white, aged three and one-half years, came to Johns Hopkins Hospital Dispensary November 25, 1892. She was born in Lebanon, Pa., and lived there until one year ago, when she was moved

to Steelton, Md. Born in natural labor; mother had only three hard pains; was a fat, healthy child up to second summer; when one year old, had summer diarrhœa, about sixteen stools daily for a month; after that the bowels became regular, and the child improved for a short while, then began to waste again without anything to account for it. She had no cough, no fever. There appears to have been no growth and no improvement since the attack of diarrhœa at one year of age, excepting the slight improvement which came on soon after the diarrhœa had been relieved, and lasted a short time. Parents are healthy, and no hereditary tendency. Mother has a younger child living and healthy; she never had a miscarriage. The child was brought to the dispensary on account of an almost constant crying, which had existed for three months. Appetite good; bowels regular; no fever; sleeps well.

Present condition. Child is thin, but not emaciated; is pale, with yellow tinge. Skin is dry, scaly, inelastic, in great folds, and appears much too large for the body. Numerous small lumps can be felt under the skin over the abdomen. Face has an idiotic or stupid expression; lips thick and coarse; tongue broad and thick, and protrudes a little between the open lips: child has only the four central incisor teeth, which are already decaying and nearly black. (The two lower incisors were cut in August, when one year of age, and just before the diarrhœa commenced. The following October was the time of slight improvement in the general nutrition of the child, and at this time the two upper incisors were cut; since then she has had no other teeth.) The nose is flat and broad; forehead low, and the head covered by thick, coarse, chestnut-colored hair. Strabismus in both eyes; fissures of the eyes very small. There is some enlargement in the neck in the region of the thyroid gland, but it is not certain that it is the thyroid. Also a thickening behind the sterno-cleido-mastoid over the clavicle. The limbs appear relatively short; they are thin, and the skin is very loose and in great folds over the limbs. Hands are large, spade-like, and the skin rough and in folds over the hands. Right wrist has been slightly œdematous for several days. Abdominal organs do not appear to be enlarged; spleen not felt. Lymphatic glands of body enlarged. Weight, twenty-seven pounds; length, 69 cm. Temperature, 98.4° in rectum. Child cannot walk nor talk; mother said it could say "mamma" and "papa," but the child does not look intelligent enough for that. Blood examination: normal amount of white elements, some of which contain pigment; crescents and cellular bodies found.

The child was under observation until February, 1892. She was treated with quinine and arsenic, and for a while appeared to improve; she was able to sit up, which was more than she could do when brought to the dispensary. When last seen at the dispensary, February 10, 1892, she had about lost what had been gained, and was pretty much as when we first saw her.

The mother said the child had got all its growth in the first year, up to the time it had the diarrhœa; that since then there appeared to have been absolutely no growth.

CASE IV. (Dr. Rotch and Dr. Bullard.)—G. S., female; aged six years, American, parents not blood relations, not the subject of goitre. Does not speak; mental condition is much enfeebled. Circumference of the head is 46.5 cm.; measurement from occiput to roof of nose, 34.4 cm.; across the

head from external meatus to external meatus, 29.3 cm. There is the general condition of infiltration like myxœdema of the skin. The thyroid gland is not to be felt. Circumference of thorax is 40 cm. The bones are somewhat enlarged about the epiphyses. The front teeth are good. (This case will be published in full by Dr. Rotch.)

CASE V. (New York Custodial Asylum for Feeble-minded Women: Dr. Brownell.)—Sarah McG., aged nineteen years, American, parents temperate. She is 86.5 cm. in height; weight, 41 pounds. The complexion is sallow;

FIG. 1. FIG. 2.

Case V. Sarah McG., aged nineteen.

voice discordant, harsh. She sleeps well; is good-natured, and is seldom ailing; is a great favorite in the household. Largest girth of head, 52 cm.; from nose to occiput, 35.5 cm.; from ear to ear over vertex, 26.7 cm.; girth of neck, 29.3 cm.; girth of chest, 54.5 cm.; girth of abdomen at umbilicus, 62.5 cm. The abomen is protuberant and the chest is narrow; the legs are perfect, but the knees incline inward. The flesh of the hands and feet looks old and wrinkled; the teeth are a good deal decayed and notched. There seems to be complete atrophy of the thyroid gland; there is fulness in the supra-clavicular fossæ; there is marked curvature of the spine, both lateral and antero-posterior.

CASE VI. (Indiana School for Feeble-minded Children: Dr. Van Swer-

ingen).—Louisa S., aged fourteen years, born in America, parents not related, no goitre in the family; nationality German. Height, 110.5 cm.; circumference of head, 56 cm.; from occiput to root of nose, 33 cm.; from external meatus to external meatus, 26.7 cm.; circumference of neck, 28 cm. The skin is loose and flabby, elastic and soft, very abundant. She is a deaf-mute, but appears quite intelligent. There is no curvature. The thorax is 57.3 cm.; abdomen, 68.6 cm. The limbs seem a little enlarged about the epiphyses. There is no goitre, and there is no trace to be felt of the thyroid gland.

CASE VII. (Syracuse State Institution for Feeble-minded Children: Dr. Carson.)—Martha L. Y., aged sixteen years; parents Americans, not related. Height, 103 cm.; circumference of head, 54.7 cm.; measurement from occiput to root of nose, 32.5 cm.; across head from external meatus to external meatus, 34.4 cm.; circumference of neck, 34.4 cm. The subcutaneous tissues appear infiltrated and myxœdematous, and there are tumor masses behind the sterno-mastoid muscle. The thyroid gland is apparently absent. The circumference of the thorax is 67.5 cm.; of the abdomen, 71.2 cm. The bones of the limbs are a little enlarged at the epiphyses. The teeth are defective. She is feeble-minded, but appears to understand what is said; can only say a few words; answers "yes" and "no." Is cleanly in habits; knows the names of objects, and can match colors.

Dr. Carson writes: "The child presents almost the characteristic features described in cretins by Dr. Down, namely: absence of the thyroid gland, puffy swellings in the supra-clavicular space; skin of an earthy color, loose, and flabby, as if too large for its body; the nose flattened; the distance between the eyes exaggerated; tongue large; lips thick; cranium brachycephalic. She speaks only a few words in monosyllables, and, though occasionally stubborn, is usually of a placid disposition, laughs easily and heartily; is orderly and cleanly in her habits.

CASE VIII. (State Insane Asylum, Stockton, Cal.: Dr. Hoisholt.)—Willie V., aged forty-two years; father was Irish, mother German; no note as to the presence of goitre. Height, 135 cm.; circumference of head, 55.3 cm.; from occiput to root of nose, 35 cm.; from external meatus to external meatus, 33 cm.; circumference of neck, 38.4 cm. The skin is very loose, and in places hangs in large folds. The head is brachycephalic. The skin of the face in smiling is wrinkled. He is imbecile. The thyroid is not enlarged. There are no definite tumor masses above the clavicle; the spine is not curved. He is said to have been much brighter some years ago. The last three years he has had occasional epileptic fits.

CASE IX.—Johnny V., brother of the preceding case, aged forty years. Height, 127 cm.; circumference of head, 58.5 cm.; from occiput to roof of nose over the head, 29.5 cm.; from external meatus to external meatus, 38.3 cm. The skin is extremely loose; hangs in folds. On the scalp one may make a fold of four inches of superfluous skin; same on the neck, face, and back. The intelligence is very defective; speech scarcely intelligible; he is not at all bright, except that he has, under the circumstances, a remarkable memory for names, remembering those of from thirty to forty patients in the ward. The thyroid gland is not enlarged.

The photographs of these two patients show marked brachycephalic heads,

wide nostrils, the eyes wide apart, and the condition of the skin described by Dr. Hoisholt appears to be fairly characteristic.

CASE X. (Randall's Island Hospital, New York: Dr. Furness.)—Nellie R., aged fifteen years, born in New York State. Height, 76.3 cm.; circumference of head, 48.4 cm.; from occiput to root of nose, 30.5 cm.; from external meatus to external meatus, 31.2 cm. The skin is coarse and thick, and there are tumor masses above the clavicles. The thyroid is not enlarged. Circumference of the thorax, 54.7 cm.; of abdomen, 51 cm.; it is distinctly pendulous. She can only stand with assistance. The epiphyses of the limbs seem somewhat enlarged. Intelligence is extremely slight, and she never talks, but can call the name of the nurse. She is affectionate in disposition, and on recognizing the Doctor utters a peculiar shrill cry.

The Doctor writes that the child looks about the age of three years; is unable to walk or to stand erect without support. The photograph illustrates a typical cretin.

CASE XI. (Inmate of the California Home for Feeble-minded Children; Dr. A. E. Osborne.)—I. N., female, aged probably thirty-five years; nationality unknown, supposed to be Irish; no data about the parents. Height, 108 cm.; circumference of the head, 56 cm.; measurement from occiput to root of nose, 35 cm.; circumference of neck, 38.3 cm.; circumference of thorax, 81.3 cm.; of abdomen, 84 cm. The face is broad and flattened; the skin rough, and hangs in folds over the body; the complexion is sallow; the hair very scanty and coarse; the teeth are defective, only half a dozen in the upper and lower jaws; no thyroid gland is palpable; the spine is slightly curved. The intelligence is of a low order, but her memory is good. The disposition is docile. She is tractable and affectionate, and forms strong attachments. She is quick to appreciate a favor, and has a fair sense of humor. The speech is slow and measured; the voice rather low and rasping. Respiration is slow, and the body temperature is below normal.

OPERATIVE MYXŒDEMA.

In connection with the subject of myxœdema, I am indebted to Dr. McGraw, of Detroit, for photographs illustrating the following case, which, so far as I know, is as yet happily unique in American surgery —namely, one of operative myxœdema:

CASE XII.—The patient, George M., is now about thirty years old, and was operated on March 7, 1881. Complete extirpation of the thyroid. The photograph [exhibited] was taken March 30, 1893. A full description of the case will be published by Dr. McGraw. Suffice it to say here that there has been a gradual but progressive change in this young man since the date of the operation. The hair is scanty and coarse; the skin thick and rough; the subcutaneous tissues very thick; the integument and underlying tissues make great ridges on the back and on the hands and feet. The intelligence is good, but the action of the intellect is slow, and he is unable to do any continuous work or to study. He complains of fulness in the head and ringing in the ears when he stoops. Even in standing he is not steady on his feet, and has a tendency to fall. Temperature is normal; pulse, 70; respirations, 20. Heart's action is normal. Voice is harsh and squeaky.

DIPHTHERIA AND OTHER MEMBRANOUS AFFECTIONS OF THE THROAT.[1]

By Francis H. Williams, M.D.,
of boston.

In discussing this subject there are three principal points to which I shall have the pleasure of calling attention. First, the diagnosis of diphtheria by means of the microscope. Second, the coincidence of diphtheria and other diseases. Third, the treatment of diphtheria.

The Report of the State Board of Health for 1891 gives valuable tables prepared with great care by Dr. S. W. Abbott, which show the mortality of various diseases in Massachusetts, from 1871 to 1890 inclusive. From them it may be seen that during these twenty years there were 56,474 deaths from pneumonia; 36,553 deaths from diphtheria and croup; 19,421 deaths from typhoid fever; and 14,639 deaths from scarlet fever. I shall show later, that even this large figure of 36,553 deaths from diphtheria and croup probably does not represent all the fatal cases of membranous throats during the twenty years. Osler states that while other contagious diseases have diminished within the past decade, diphtheria, particularly in cities, has increased. Moreover, the mortality in this disease is very high, from 40 per cent. to 60 per cent. of the patients dying.

Precise discrimination between different kinds of membranous throats was formerly impossible, but within the last ten years, beginning with the careful observations of Klebs and Loeffler, it has been shown that among membranous affections of the throat there is one of supreme importance which is characterized by the presence of an organism known as the Klebs-Loeffler bacillus. There are often other organisms present with this bacillus, but they are not of such serious import. These other organisms, chiefly various forms of cocci, may also be found in the throat without the bacillus, but associated with such appearances that they often cannot be distinguished from those accompanying the bacillus, except by the aid of the microscope. It has been agreed to call the most fatal of these membranous inflammations of the throat, the disease identified by the Klebs-Loeffler bacillus, diphtheria; certain other forms of membranous throats are often designated as pseudo-diphtheria. Let me recall to your minds some of the characteristics of this bacillus disease, diphtheria. In the beginning it is local; the bacilli grow on or in a mucous membrane or wound, at which point a false membrane is formed; they do not as a rule enter the system—although

[1] Read at the annual meeting of the Massachusetts Medical Society, June 14, 1893.

Frosch[1] has found them in various organs of the body in ten out of fifteen autopsies after diphtheria—but their baneful effects are exerted chiefly through a very poisonous substance, diphtherotoxin, which they secrete and which is soluble and readily absorbed. This substance, which is a toxalbumin, has been isolated, and when freed from all bacilli and injected into animals, causes many of the symptoms of diphtheria, such as paralysis, heart failure and local necrosis, but it does not give rise to a false membrane.

The early recognition of a disease so dangerous to the individual and to those near him as diphtheria is of the first importance, and yet by the ordinary methods an early diagnosis is nearly always impossible. It may even in the very early stage be confounded with follicular tonsillitis. Fortunately, we have now in our hands a means of diagnosis which is excellent precisely in the early stage of the disease. It consists in the examination of cultures made from the suspicious throat, and subsequent inoculation of animals; this requires special training and appliances, and it is necessary to wait about twenty hours to learn the result of the cultures, and longer to learn that of the inoculations.

The Boston City Hospital is now erecting much larger buildings for contagious diseases; at present there are two buildings, each containing two wards besides separate rooms devoted to the contagious service, one for diphtheria and the other for scarlet fever. In the diphtheria wards patients when needing tracheotomy or intubation go to the surgical service, the others to the medical service. Beginning with 1891 I have had during medical services in these wards 442 patients; 211 of these had membranous inflammation of the throat; 231 scarlet fever, complicated in 58 cases with severe membranous inflammation of the throat, making in all 269 patients with membranous throats. The diagnosis by cultures, which I initiated at the hospital, was made in 93 of the cases of membranous throats that were under my care during about three months of 1892 and 1893. In 3 of the cases cover-glass preparations only were made. These 96 cases are classed as follows:

TABLE I.

	Cases.	Recovered.	Died.
Diphtheria	40	20	20
Diphtheria and scarlet fever	12	6	6
Diphtheria and measles	1	1	—
Diphtheria and typhoid fever	1	1	—
Pseudo-diphtheria	19	17	2
Pseudo-diphtheria and scarlet fever	23	18	5
	96		

These examinations showed that a considerable number of the cases with false membranes that were admitted to the diphtheria ward were

[1] Zeitschrift für Hygiene und Infectionskrankheiten, 1893, Bd. xiii. Heft 1.

not diphtheria, thus demonstrating the necessity for bacteriological examinations. Furthermore, in four of those that were diphtheria there was no membrane in sight. This likewise shows the importance of bacteriological examination where there is the least suspicion of diphtheria.

My plan was to have a sterilized cotton swab rubbed over the throats of all patients coming to the medical side of the diphtheria ward, except those too weak to be disturbed, and over the throats of all those in the scarlet fever ward who might at any time have a deposit in the throat, and cultures were then made, except in a few instances, where cover-glass preparations only were made.

Let me now direct attention to these 96 cases in which the diagnosis was made by means of the microscope, which consist of two series: the first series of 23 cases in 1892, from which the cultures, followed in some cases by inoculation of guinea-pigs, were made for me by Mr. A. P. Mathews, assistant in biology at the Massachusetts Institute of Technology, to whom I am much indebted, and a second series of 73 cases in 1893, for which I enlisted the interest and co-operation of Professor Councilman, under whose direction the cultures were made, and of Dr. E. M. Holden, who gave freely the large amount of time which work of this character requires and on which its success so much depends.

In 49 (Table II.) of the 93 cases I made a preliminary cover-glass examination, when I first saw the patient, from the material adhering to a sterilized cotton swab directly after it had been rubbed over the suspected throat—this examination can be made in a few minutes in the ward or at the patient's house—and on the following day learned the result of the examination made from cultures. If either examination shows the characteristic bacilli every precaution should be taken.

TABLE II.—*Diagnosis of Diphtheria based on Cultures.*

(Both cultures and cover-glass examinations made.)

Diphtheria	20
Diphtheria and scarlet fever	3
Pseudo-diphtheria	8
Pseudo-diphtheria and scarlet fever	10
Tonsillitis	6
	47

In 38 of these 47 cases (cases 48 and 49 will be referred to later) the cultures and cover-glass examinations agreed, in 7 disagreed, and in 2 cases the result of the cover-glass examination was doubtful. Two of the 7 cases where the two methods disagreed are classed in the table as pseudo-diphtheria, the bacillus not being found in the cultures, although thought to be present in the cover-glass examinations. These two patients died. The third case is classed in the table as pseudo-

diphtheria and scarlet fever, as the bacilli were not found in the cultures, although thought to be present in the cover-glass examination. The brother of the patient had diphtheria and scarlet fever. In the fourth case, where the two methods disagreed, I probably mistook some other organism for the bacillus on the fourteenth day of the disease. In the three remaining cases I failed to find the bacilli in the cover-glass examination, but they were found in the cultures. In the forty-eighth case, not noted in Table II., the bacilli were found neither in the culture nor in the cover-glass examination, but the patient did not enter the hospital until the thirty-fifth day of the disease; she had post-diphtheritic paralysis on the thirty-third day of the disease.

The preliminary examination is of service when the cover-glass shows abundant and characteristic bacilli; it seems to be more satisfactory in the early than in the later stages of the disease. In the later stages the bacillus is more apt to be obscured by slower-growing organisms; failure to find the bacilli does not establish their absence, and the cover-glass examinations should of course be followed by cultures.

The cultures are not infallible; for some reason, such as the presence of a small quantity of corrosive sublimate, the bacilli may not grow when planted, and therefore may not be found in the cultures. With all the sources of error, however, we now have at our disposal a method of diagnosis far better than anything we have had heretofore, which enables us to recognize early the most dangerous among the acute diseases of the throat which are characterized by a membrane. It is a great relief to the family and friends, as well as to the physician, to have such assurance as this means of diagnosis gives us, that certain apparently most serious cases are not cases of diphtheria. It likewise points out to us mild cases of diphtheria that clinically might be classed as pseudo-diphtheria, but the contagion from which might give rise to a serious illness in another individual. By its aid also we may learn in the future to recognize better the symptoms that distinguish diphtheria from other membranous affections of the throat. Further, it shortens the stay of the patient in the hospital and diminishes the period of convalescence for those who have had only pseudo-diphtheria, as unless we can distinguish between them we are compelled to be over-careful of cases in which the after-effects are not so much to be dreaded. As a rule patients in whose throats the bacillus is not found may get up and go about early, while in the cases of diphtheria one should make haste slowly, as even lifting a child out of its crib to feed it may bring on heart failure some time after the acute symptoms have disappeared. Likewise it may sometimes be of great importance to summon the family or friends from a distance if we are assured early that the disease is a very dangerous one.

Diphtheria usually begins on the tonsils, so far as my experience

goes. It is sometimes stated that when the false membrane is limited to the tonsils the disease is not diphtheria, but that if the membrane covers also other parts of the throat the disease probably is diphtheria. Let us consider for a moment what bearing, if any, the distribution of the false membrane has upon the diagnosis. In the 23 cases of scarlet fever complicated with pseudo-diphtheria (Table III.), the membrane was limited to the tonsils in 5 only, and in 3 it had evidently extended to the larynx. In 2 cases of pseudo-diphtheria (Table I.) the membrane had also extended to the larynx.[1] These 5 laryngeal cases were children, the eldest of whom was five years old. In 4 of the 40 diphtheria cases (Table I.) there was no membrane in sight; in 5 the membrane when first seen was on the tonsils only, but it spread later to other parts. In one-half of the pseudo-diphtheria cases (Table I.) the membrane was on the tonsils and other parts. These facts show that in making a diagnosis it is not advisable to place reliance upon the distribution of the membrane, although it seems usually to be more widely distributed in diphtheria than in pseudo-diphtheria.

Extreme youth, the presence of membrane in the larynx or even lower, and a weak heart all influence the prognosis most unfavorably.

We now come to the *second* point, the coincidence of diphtheria and other diseases. Let us consider first the coincidence of diphtheria and scarlet fever, the occurrence of which has been questioned and much discussed. In the series of cases of both 1892 and 1893, already alluded to, such association occurred. In 97 of the cases of scarlet fever the diagnosis was made by cultures in all those that had membranous throats. The result was as follows:

TABLE III.

	Cases.	Died.
Scarlet fever	62	8
Scarlet fever and pseudo-diphtheria . . .	23	5
Scarlet fever and diphtheria	12	6
	97	

In one of the 12 cases of diphtheria complicated with scarlet fever diphtheria was followed by scarlet fever, in one preceded by scarlet fever, and in ten cases diphtheria and scarlet fever occurred simultaneously. This class of cases seems to be rapidly increasing in Boston.

A noteworthy point in this table is the fact that there were more deaths among the 35 cases of scarlet fever complicated with membranous throats than in the 62 cases of scarlet fever only: as we should expect, in scarlet fever complicated with diphtheria, it is the Klebs-Loeffler bacillus which is the dangerous factor and which threatens the life of the patient much more than the scarlet fever. In the light of this ex-

[1] Intubation or tracheotomy may be required in pseudo-diphtheria.

perience, a former series of my scarlet-fever cases is interesting. There were 86 in this series, 19 of which were complicated with membranous throats, and 67 were uncomplicated. Of the 67 cases of scarlet fever, 3 died, or 4½ per cent.; of the 19 cases of scarlet fever complicated with membranous throats, 9 died, or 47 per cent., showing in this series also the high mortality of scarlet fever when complicated with membranous throats as compared with scarlet fever only. These cases came under my charge before a diagnosis by cultures was made in this community.

The source of some of the cases noted in Tables I. and III. deserves a word in passing: 35 of them came from two Homes for Children. The first home sent 19 patients to the hospital between February 14th and March 20th, inclusive. The epidemic began with scarlet fever, of which there were 13 cases, and continued with cases of scarlet fever complicated with pseudo-diphtheria, and scarlet fever complicated with diphtheria, and ended with one case of diphtheria alone; this patient was an adult. The second Home for Children sent 16 cases to the hospital, which included the same variety of diseases as the first.

The coincidence of this bacillus with other diseases than scarlet fever is also interesting. In three of the cases diphtheria and measles probably occurred together. Two of these died. The third and only one in which a swab was taken from the throat (Case 49, already alluded to), has a special interest in that the bacilli were detected readily on a cover-glass by both Dr. Councilman and myself, but they failed for some unknown reason to grow in the culture media, although two trials were made. There was abundant opportunity in this case to get some of the membrane, as the child coughed up large pieces of it.

Another case of interest is one in which diphtheria and typhoid fever occurred simultaneously:

L. J., a girl aged seventeen years, well developed and nourished, was ill with cellulitis of the leg, with possible caries of the femur, for some weeks before she came into my service. Five days before entrance she complained of sore-throat, and two days later a membrane was seen in the throat, in which Dr. Councilman found the Klebs-Loeffler bacillus. The membrane was seen for the last time on the eighth day after entrance. On the day of entrance the temperature was 104° to 105°, and the pulse 130 to 140, but on the following day the temperature reached 105° and the pulse 150; one rose spot was found on the abdomen; the number of spots increased daily for seven days, and were unusually numerous and characteristic. The spleen was enlarged, and its lower edge could be felt at the margin of the ribs. Hæmoglobin was 90 per cent., and the number of leucocytes normal, 7500. On the third day the stools were typhoidal and the patient dull. The pulse was 110 to 120, the temperature remained about 104° for a week, and then fell by lysis to normal. Recovery.

These cases suggest a connection between the bacillus of diphtheria and certain of the paralyses which sometimes occur after scarlet fever, measles, and typhoid fever. Furthermore, the mortality from diphtheria in our State should include some of the cases classed under scarlet fever, measles, and typhoid fever, as already suggested.

We now come to the *third* point, namely, the *treatment* of diphtheria, and this subject divides itself naturally into two parts, general and local treatment. The former may be outlined in a few words. The food of the patient deserves special attention. Alcohol is, in some cases, of service. Iron is frequently given for anæmia.

In 19 cases—

Diphtheria	9
Diphtheria and scarlet fever	3
Pseudo-diphtheria	4
Pseudo-diphtheria and scarlet fever	3
	19

—most of which appeared anæmic, I determined the hæmoglobin by Fleischl's hæmometer, and this instrument did not in the majority of cases confirm the apparent anæmia. Sixteen of these 19 cases, children and adults, had about, and in some cases more than, 100 per cent. of hæmoglobin. The 3 remaining cases were all children. In the first of these, a child five years old, ill with diphtheria, the hæmoglobin was 75 per cent. In the other two, children of a year old, one ill with diphtheria, the other with pseudo-diphtheria, the hæmoglobin was about 50 per cent. Mercury in small doses has been recommended, but it did not seem to me of service in the few cases in which I have used it or seen it used. The cases of Behring treated with the blood-serum of immune animals encourage us to hope that a feasible internal remedy may be found.

At present local remedies are our best means for the treatment of this disease, and obviously they are best adapted to those cases that are seen early, before much of the poison has been absorbed, and further, to cases in which the membrane is accessible.

Given a patient in whose throat is a patch of membrane filled with bacilli that reproduce themselves in a very short period and which generate a soluble and most virulent poison; a membrane that may be thick and tough, and over the surface of which there constantly passes a stream of saliva that will quickly carry away the remedies applied to it; situated in a region to which applications can be made for short intervals only, and even then is not easy of access: what should we do? It is worse than useless to tear off the membrane; this causes bleeding; the membrane rapidly returns, and over a larger area. The bacillus seems, above all things, to delight in the blood-serum, and the

spread of the membrane follows the course of the bleeding as eagerly as a hungry horse will follow oats. Bacteriologists, in searching for a medium in which to tempt the bacillus to grow outside of the body, have found nothing better adapted to the organism than blood-serum.

Chlorate of potash does not seem to me of service and in excessive doses may do serious harm. Nitrate of silver is a caustic that does not penetrate deeply. Chromic acid is one of the most relentless of all caustics. Iodine is irritating when inhaled, as are the vapors from saturated solutions of chlorine. Solutions of carbolic acid are poisonous and inefficient as germicides. I have not succeeded with digestives. *Sesqui-chloride of iron*, often used in the form of a tincture, has been, and with some still is, a favorite application. Knowing that these iron preparations contained free acid, I thought it probable that the acid rather than the iron would prove to be the active agent. To test this, Mr. A. P. Mathews compared for me a solution of chloride of iron with a solution containing no iron, but having the same quantity of acid as in the iron solution. The iron solution was found to be no better as a germicide against the bacillus of diphtheria than the acid water, thus showing the acid to be the essential agent in the iron solution. The *tincture* of the chloride of iron contains 2.5 per cent. to 3.4 per cent. of free hydrochloric acid; the *solution* of chloride of iron contains from 5.4 per cent. to 7.4 per cent. of free hydrochloric acid. These iron solutions are an excessively unpleasant treatment. *Corrosive sublimate* has much reputation as a germicide, but its action seems to be inhibitory rather than germicidal. I insert here three cases of diphtheria, the diagnosis of which was based on cultures, in which corrosive sublimate was used locally, as better treatment was not at the time practicable, and they show how the membrane may persist under its use:

J. B., aged twelve years, entered the hospital on the third day of the disease. Membrane was seen on both tonsils, both sides of pharynx, and a small spot one-eighth of an inch in diameter on posterior pharynx. Klebs-Loeffler bacilli found in culture. The local treatment for thirteen days was corrosive sublimate 1:10,000 in spray every four hours, but in spite of this the membrane continued to cover more area and to become thicker until the eighth day of the disease, when the throat began to clear. Septic odor. On the tenth day, no bacilli were found in culture; their growth was probably inhibited by the presence of corrosive sublimate. On the sixteenth day, the throat was clear. The heart was noticeably weak in its action, and tincture of digitalis was given. After six weeks, the patient left the hospital for the Convalescent Home. There had been nothing seen in the throat for twenty-six days, and she had been about the ward. She passed three weeks in the Convalescent Home, and then on account of hoarseness returned to the hospital. My service was then at an end, but the records, which I have the privilege of inserting here, state that there was "a piece of membrane adherent to one vocal cord. After eleven weeks, the tonsils were large and covered with a whitish film or membrane which could be

wiped off with difficulty; breath foul. Dr. Councilman found Klebs-Loeffler bacilli abundant." The last record of membrane, which was on the tonsils, was almost twelve weeks after the onset of the disease. The patient was discharged on the one hundredth day of the disease.

This case illustrates the futility of the 1 : 10,000 solution of corrosive sublimate in preventing the spread of the membrane, and the persistence of the bacilli in spite of its use. It would be desirable to have bacteriological examinations made of every throat before the patient is allowed to leave the contagious ward, care being taken not to have corrosive sublimate used at the time the swab is rubbed over the throat, as a very small amount of it will inhibit the growth of the bacilli in the culture tubes.[1]

In the two following cases the attempt was made to get a cleansing action from a weak (7.5-volume[2]) solution of hydrogen peroxide to assist the action of the 1 : 10,000 corrosive sublimate.

In the first of these the patient, a woman aged twenty-two years, had paralysis on the fifteenth day of the disease, and the throat was not clear until the seventeenth day of the disease. In the second case, M. McP., a woman aged twenty-eight years, entered the hospital on the third day of the disease. Thick membrane on both sides of the uvula and on the left tonsil. Klebs-Loeffler bacilli found in culture. The local treatment was a spray of 7.5-volume solution of hydrogen peroxide every two hours, followed by a spray of corrosive sublimate 1 : 10,000. On the seventh day of the disease the patient was hoarse and evidently the membrane had spread to the larynx. Prostration. Reduplication of heart sounds. After ten days a spray of corrosive sublimate 1 : 20,000 was used every four hours. Three days later this was omitted, as the patient was salivated. Seventeenth day, paralysis. Thirty-fourth day the throat was clear. The patient was discharged on the forty-first day of the disease.

These cases show that the membrane may not be removed, but may continue to spread under a local treatment of corrosive sublimate 1 : 10,000, as illustrated in J. B., and also when this is used in connec-

[1] Since this paper was read a man has come to the hospital with naso-pharyngeal paralysis. No membrane was seen in the throat by the physicians who examined him, but Klebs-Loeffler bacilli were found in the cultures. The history of the case showed that the attack of diphtheria had begun about eight weeks previously. This case also shows the importance of bacteriological examination before isolation is ended.

[2] In the United States a 20-volume solution of hydrogen peroxide has been and still is one which will yield 20 times its volume of oxygen, if decomposed by permanganate of potassium; but one-half of this oxygen is contributed by the permanganate, as it is likewise decomposed. The hydrogen peroxide (or dioxide) water, described in the United States Pharmacopœia for 1890, which will be official on January 1, 1894, is a 10-volume solution, and one in which the number of the volumes named denotes the amount of its own available oxygen. This 10-volume solution is therefore equivalent to the 20-volume solution described above. I have adopted in this article the Pharmacopœial manner of indicating the strength of the hydrogen peroxide solutions, and, therefore, the 50-volume solution of my paper of 1892 becomes here a 25-volume solution.

tion with a dilute solution of hydrogen peroxide, as illustrated by the last two cases.

It would take too long even to enumerate the various kinds of local treatment that have been used in diphtheria, but there are certain conditions to be fulfilled that will serve as a guide in our selection.

We need an agent that will kill the bacilli quickly, and will not injure the patient by its harmful or poisonous attributes. The first step in an investigation of this kind is to ascertain what will kill the organism in the laboratory, although it does not follow that the same result will be obtained in the throat. In the experiments made for me in the Biological Laboratory of the Massachusetts Institute of Technology with various germicides on the bacillus of diphtheria, I chose the short period of ten seconds for the limit of time during which they were allowed to exert their action, as the contact of the germicide with the membrane in the throat must necessarily be short.

The results of a few of the experiments were as follows: A saturated solution of carbolic acid did not kill the bacilli in ten seconds. A solution of hydrogen peroxide of between 12 and 25 volumes, containing $\frac{1}{4}$ to $\frac{1}{2}$ per cent. of acid respectively, killed the bacilli in ten seconds, but it took over a 50-volume nearly neutral solution of hydrogen peroxide to do the same work.

The ordinary hydrogen peroxide solutions offered for sale have a strength of 7.5 or 10 volumes or much less—some of these are neutral, others acid.[1] These weak solutions, whether neutral or acid, are not active germicides, judged by their effect upon the bacillus of diphtheria, an organism which is not so difficult to kill as the staphylococcus for instance, but the neutral solutions have far less germicidal power than the acid ones. I pointed out by some observations published last year,[2] the distinction that should be drawn between the nearly neutral and the acid solutions, but it is evident that this point needs further emphasis, particularly as the solutions of hydrogen peroxide are coming more into use, and neutral ones are made which are excellent for certain purposes, but which being nearly free from acids, have little germicidal value against the bacillus of diphtheria, *except in unusual strength.*

The strong hydrogen peroxide acid solutions, by which I mean strengths of 25 to 50 volumes or more, as already shown, are efficient germicides in the laboratory, and they have besides the special quality of breaking up and disintegrating certain portions of the diphtheritic membrane without injury to the healthy tissues, thus rendering the bacilli more accessible.

[1] It is interesting to note the importance of the mineral acids, especially hydrochloric acid; they are of value in the hydrogen peroxide solutions, and are good germicides when used alone; hydrochloric acid is, as we have seen, the active agent in the iron solutions, and is also a valuable germicide in the gastric juice.

[2] Boston Medical and Surgical Journal, September 29, 1892.

Having found a substance that has no poisonous properties, namely, a strong solution of hydrogen peroxide, that is shown to be an efficient germicide in the laboratory, let us see what it will do clinically. I was so situated that in most of the cases in which the diagnosis was carefully made by cultures, the strong hydrogen peroxide solutions were not used, and in most of the cases in which the peroxide treatment was used the cultures were not made. I have made some use, chiefly in 1892, of strong peroxide solutions, in seventy-four cases in all; sixteen of these died and fifty-eight recovered; but as, in most of these, the diagnosis was not based on cultures, it is impossible to state exactly how many were diphtheria and how many pseudo-diphtheria. In the sixteen cases that died the patients entered the hospital after they had been ill an average of five days, so far as I could learn. Eight of these died within one to three days after entrance. There was not much opportunity for treatment, and the hydrogen peroxide was omitted when the patients seemed too weak. Two entered the hospital on the last day of my service, and the strong solutions of hydrogen peroxide were employed on that day only. These patients died about two and four weeks later, respectively. In four cases the membrane was in or extended to inaccessible parts of the throat, and in but one of these was there temporary improvement. In the fifteenth case the patient had diphtheria (as shown by subsequent paralysis) and scarlet fever simultaneously. There was local improvement, but the child died about the fifteenth day of the disease. In the sixteenth case scarlet fever developed on the twelfth day of the disease, when the throat was nearly clear. The patient did well until the fifteenth day, then had suppurating glands and died on the nineteenth day of the disease.

In the four following cases, the diagnosis of which was based on cultures, the strong hydrogen peroxide acid solutions were used. The first two are cases of pseudo-diphtheria.

E. F., aged twenty years, entered the hospital on the second day of the disease. Thin, gray membrane on left tonsil and all along the arch of soft palate. Mr. Mathews found streptococci on cover-glass and in culture, but no bacilli. The membrane was cleared off completely with 50-volume solution of hydrogen peroxide applied with a swab, and this was followed by an application of chlorinated soda. Spray of 25-volume hydrogen peroxide solution every four hours. On the fifth day of the disease, but the third after treatment, the throat was clear. Recovery.

C. D., aged twenty-three years, consulted me on account of some slight difficulty, and, as a matter of routine, I looked in her throat, which was then clear. On the following day, I was much surprised to be sent for in some haste, and then found on both anterior pillars, tonsils and uvula, patches of membrane, which were one-sixteenth of an inch thick and could be removed with some difficulty with the edge of a teaspoon, but this caused bleeding. I removed most of the membrane with

a 25-volume hydrogen peroxide solution, but left the base of one patch on the soft palate, about one-fourth of an inch in diameter, fearing that further attempts to remove it might set up bleeding, as here the mucous membrane looked as if the surface had been etched off. As this patch was at a point readily accessible to a gargle, I left the patient at 1 P.M. with directions to use a dilute acid solution of hydrogen peroxide every half-hour and to follow this by a gargle of diluted solution of chlorinated soda. At my second visit, three and one-half hours later, I was much gratified to find the throat entirely clear of membrane. I saw the patient daily for some days, during which mild antiseptic sprays and gargles were used, but there was no return of the membrane. This was seen only at my first visit. No Klebs-Loeffler bacilli were found in cover-glass examination. Cultures showed streptococci and staphylococci.

We may look for better results in private practice than at the hospital, as in the former case patients are generally seen earlier.

In the two following cases of diphtheria, the diagnosis of which was based on cultures, there was partial use only of strong solutions of hydrogen peroxide, but even by this, good results were accomplished.

A. B., aged twenty-four years, entered the hospital on the second day of the disease. 4 P.M., membrane on right tonsil, thick in places, cartilaginous in character. Membrane also on left tonsil and left wall of pharynx. Klebs-Loeffler bacilli found on cover-glass and in culture. Strong hydrogen peroxide acid 25-volume solution was applied in spray, and 50-volume by syringe and swab, and the membrane removed except in points around anterior edge of left tonsil which were cartilaginous in character. The patient said there was less pain in swallowing a few minutes after the application of the peroxide than before, and after this application he ate his evening meal of eggs on toast, etc. At 9 P.M. the membrane had returned to some extent over its area of 4 P.M., but was not so thick and had not spread. Strong hydrogen peroxide was again applied. Spray of corrosive sublimate 1:10,000 given every two hours through the night. Large dose of bromide at night to prevent serious loss of sleep from frequent waking. The patient slept ten hours. No hydrogen peroxide solution was applied during the night, and the next morning the membrane was found to have spread rapidly over both sides and on to the back of pharynx in spite of the 1:10,000 corrosive sublimate that had been applied every two hours. There seeemed to be some membrane in naso-pharynx. Strong hydrogen peroxide acid solution 25 and 50 volumes was then applied to the throat on swab. A solution of chlorinated soda, 1:6, was applied every two hours in spray. At 8 P.M., large dose of bromide. On fourth day of disease, membrane over same area as on the third day; 25- and 50-volume hydrogen peroxide applied morning and afternoon, followed by chlorinated soda. The membrane seemed to be kept from spreading or becoming thick if the applications of hydrogen peroxide were made every four hours, but otherwise it gained in thickness and somewhat in extent. Fifth day of the disease, general condition excellent. Membrane much less in extent and thinner. Hydrogen peroxide only twice during the day. Membrane seemed under control. Sixth day; the patient had eaten well before, but now had appetite. General condition excellent. Throat clearing. Two applications of hydrogen

peroxide, although this seemed hardly necessary, but it was done to prevent the possibility of relapse. Two per cent. spray of cocaine applied to throat prevented pain from the application of the peroxide. On the seventh day of the disease, and the fifth after entrance, a final application of peroxide was made. The patient left the contagious ward six days later. There was no cardiac weakness, no depression, and no paralysis.

M. L., aged eighteen years, entered the hospital February 25th, on the second day of the disease. His throat had the appearance of a follicular tonsillitis. On my first visit I found Klebs-Loeffler bacilli, micrococci and streptococci in a cover-glass examination. The next day Dr. Councilman obtained an almost pure culture of Klebs-Loeffler bacilli. At 1 P.M., there were two small patches of membrane on the right tonsil, the one an eighth by a quarter of an inch and the other an eighth of an inch in diameter. These were removed with six minims of a 25-volume hydrogen peroxide solution in syringe, and this was followed by an application of chlorinated soda. At 5 P.M., the throat was again cleared carefully with 25-volume hydrogen peroxide solution by swab and syringe, followed by an application of strong chlorinated soda on swab. At 9.30 P.M., the membrane was not visible except a thin, yellowish, translucent deposit over original area, namely, on right and left tonsil. This was cleared off with the hydrogen peroxide solution, and was followed by chlorinated soda solution. No hydrogen peroxide was used through the night, but a solution of chlorinated soda was applied every two hours. In spite of this, on the following morning the membrane had spread over the larger part of the right tonsil, and there was also a strip of membrane three-fourths by one-eighth of an inch on each side of the pharyngeal wall. This was cleared off again with 25-volume hydrogen peroxide solution on swab at 10.30 A.M. and again at 5.10 P.M. On the fourth day of the disease, only two applications of the peroxide were made, as the membrane was readily controlled, and on the fifth day one final application of the peroxide was made. On the sixth day of the disease, and fourth after entrance, the throat was clear. Patient felt well and asked if he might get up. Discharged after being kept under observation ten days longer. There was no cardiac weakness, no depression, and no paralysis.

In these two cases the strong solution of hydrogen peroxide was used only two or three times in the twenty-four hours, and the membrane returned during the long intervals of several hours when it was not applied, in spite of the use of corrosive sublimate or chlorinated soda every two hours. These cases had only a partial peroxide treatment. In both instances, the condition of the patient was excellent throughout the illness. These two cases suggest that by early local treatment with peroxide we may diminish the generation and absorption of poison from the bacilli.

I have found nothing that will remove the membrane so well as the strong solutions of hydrogen peroxide.

The *drawbacks* of the strong solutions of hydrogen peroxide[1] consist,

[1] I give some details concerning the strong hydrogen peroxide solutions, as they are a novelty. Physicians and chemists told me that even 25-volume solutions were impracticable

first, in the fact that the acid solutions, which are stronger germicides, cause pain, due to the acid, which lasts about one minute. Some patients object to this very much; others, including children, will permit the use of a 50-volume solution with little fuss. In private practice, I recall a young lady who applied the 50-volume solution to her own throat on a swab and used it more frequently than I had directed. On another occasion I suggested in consultation that cocaine be first applied to the throat, but the physician in attendance said it was unnecessary, as the patient, a child three and one-half years old, did not mind the 50-volume solution, which he had been using in spray. The discomfort is due to the acids rather than the hydrogen peroxide; if the solutions are neutralized the discomfort is largely obviated. We may disguise the acid by adding sugar, as in lemonade, showing that it is the acid taste that is disagreeable rather more than the so-called irritation. Instead of adding sugar we may apply cocaine to the throat before we use the hydrogen peroxide solution. The amount of acid in the 25-volume solution which I used was ½ per cent., in the 50-volume 1 per cent. This is far less than the amount of acid in the chloride of iron solutions, for, as already stated, the tincture contains from 2.5 per cent. to 3.4 per cent. of hydrochloric acid, and the solution of the chloride of iron from 5.4 per cent to 7.4 per cent. of hydrochloric acid.

Second. Strong solutions of hydrogen peroxide[1] have not been easily procured, nor do they bear transportation well, but these inconveniences may be readily surmounted. The apothecary or physician has merely to evaporate a 10-volume solution in a shallow, open dish, over a water-bath, or on a range or stove, to obtain a solution of either about 25 or 50 volumes.[2] The initial solution should not be too acid, the dish should not be of metal and should be free from organic matter.

or impossible, but as the caution came after I had had a 100-volume solution I was not dismayed.

Unlike chlorine and chlorinated soda, corrosive sublimate, if desired, may be mixed with hydrogen peroxide; citric or tartaric acid should be added to prevent the precipitation of albuminate of mercury in the throat.

It gives me pleasure to again express my indebtedness to Professor H. P. Talbot, of the Massachusetts Institute of Technology, for his assistance in the study of hydrogen peroxide.

[1] The stability of the strong solutions and the precautions to be used for keeping them I have already described in a former article. As soon as the properties of strong solutions are more widely known and it is appreciated that they may be obtained without much difficulty, they will, I believe, find other uses than that of a local application in diphtheria. They should not, of course, be employed in closed cavities, as the oxygen liberated might cause pressure.

[2] To be more precise, a 25 or 50-volume solution may be obtained by evaporating a 10-volume solution to ⅕ or 1/10 of its bulk respectively. The loss of the hydrogen peroxide is usually less than 10 per cent. in the former case, and about 20 per cent. in the latter. The temperature being the same, the loss seems to be less when the hydrogen peroxide is evaporated quickly than when the process is carried out more slowly. One teaspoonful of a 50-volume solution is ample with which to begin the treatment. The strong solutions should be kept in a cool place.

By evaporating 200 c.c. of a 11.5-volume solution I have obtained a 275-volume solution. A drop of this applied to my tongue caused momentary smarting.

A 10-volume solution of hydrogen peroxide may be tested in the following way: One drachm

Third. Hydrogen peroxide is a bleaching agent and should not be brought into contact with the hair or with colored fabrics, but it does not injure white cotton or linen. One should avoid getting it on the fingers, as it may, after a few minutes, whiten a thickened epidermis and cause a sensation of pricking.

The *advantages* of the strong hydrogen peroxide solutions are that they are good germicides and are not poisonous nor harmful to the mucous membrane; they cleanse a foul throat and break up and disintegrate certain portions of the diphtheritic membrane, thus rendering the bacilli more accessible. They likewise assist in diagnosis, for when the hydrogen peroxide, even in weak solution, is applied to the throat where there is any trace of membrane, it causes it to asume a white color from the presence of fine foam which is made by the liberation of the oxygen gas. It thus becomes a useful agent in detecting spots of membrane earlier than they would be apparent in any other way, and thus indicates the areas to which the treatment should be directed. With this end in view, the throat may be sprayed or the mucous membrane may be swabbed with dilute hydrogen peroxide. It is known that corrosive sublimate to a considerable extent is inhibitory rather than germicidal in its action, but it would be difficult to conceive of a merely inhibitory action on the part of hydrogen peroxide, as this substance is so readily decomposed.

No rule can be given for applying these solutions that will cover all cases. In a general way it may be said that the strong solutions of hydrogen peroxide containing about ½ per cent. of acid, made up chiefly of hydrochloric or sulphuric acid, should be gently but thoroughly applied every four hours during the night and more frequently during the day for the first few days. The 25-volume solution may be used in spray; the 50-volume may be applied, a drop or two at a time, on a swab until the membrane is removed or much diminished, or in certain cases the 50-volume solution may be applied with the syringe. Even a stronger solution than 50 volumes may be used for resistant membranes. It is well to use cocaine before applying the peroxide. By the help of bromide at night, the patient loses very little sleep in being aroused for the local treatment. Every precaution should be taken to spare the patient's strength, and it is not necessary that the head should be raised from the pillow while the applications are being made.

As the bacilli are not limited to the diphtheritic membrane, antiseptics should be brought into contact with other portions of the throat

of it diluted with about an ounce of water and acidified with about three drachms of dilute sulphuric acid will dissolve and decompose three grains of permanganate of potassium (in crystals) and leave a colorless solution. If the strength is less than 10 volumes the solution will finally be of a bright-red color.

and nose than those covered with membrane, by such means as sprays and gargles, as a prophylactic measure.

The accompanying cuts show the instruments which I have designed for making applications to the throat; but any good atomizer, not of metal, that will reach the desired spot conveniently, or a swab made by twisting a small piece of absorbent cotton about the end of a small stick, may be used.

FIG. 2.

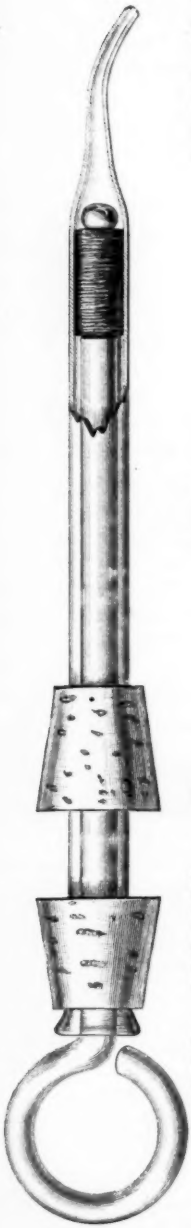


FIG. 1.

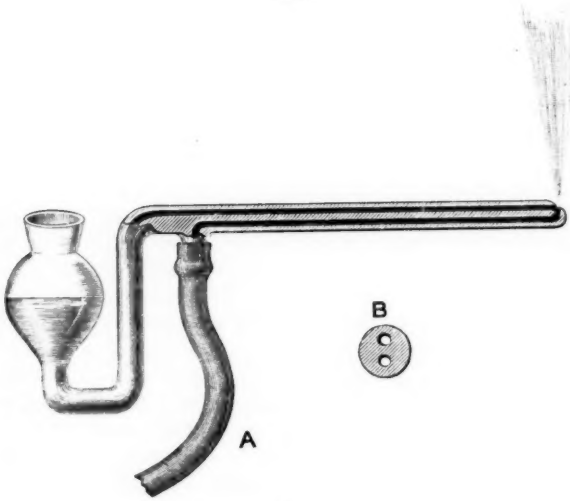


FIG. 3.

FIG. 1.—A, rubber tubing to hand-bulb. The cut is one-half size except the section of the tube at B, which is full size. The bulb in the drawing should have more the shape of a top, and when of such shape it can be placed on its side without losing any of its contents if it is not more than half full. If the tubing, A, which joins the rubber hand-bulb to the atomizer is only about one inch long, the atomizer can be worked with one hand. It will be noticed that the straight tube of the atomizer is unusually long—more than four inches from the rubber tubing to the tip.

FIG. 2.—The *syringe* is of glass one inch longer than the drawing, otherwise this is the full size. The walls of the syringe beyond the piston are thick, and the tip is smooth, having been rounded in a flame. The form is such that it can reach any part of the throat within sight. The corks are now replaced by glass projections. The packing may be of cotton or asbestos. The cost of the syringe is trifling.

FIG. 3.—The *swab* is eight inches long, but otherwise the drawing is full size.[1]

[1] These are made by P. J. McElroy, East Cambridge, Mass., U. S. A.

By means of this atomizer (Fig. 1) the spray may be sent in three directions, up and right and left, in the throat without taking it out of the mouth, but merely turning it in the hand.

The syringe (Fig. 2) may be pushed through the false membrane and a drop or two of solution pressed out, the oxygen then generated underneath a *thick* membrane will lift off large pieces of it. In this way large numbers of bacilli are removed, the poison from which might otherwise be swallowed and absorbed.

The swab (Fig. 3) used to apply the solution consists of a small glass tube drawn out at one end into a smaller rod, about which sufficient absorbent cotton has been twisted to hold two or three drops of liquid. The end of the rod has been rounded in a flame and made slightly bulbous, as shown by the dotted line; by this device the cotton is held firmly.

The sterilized swab and its holder, seven inches long, which I used for taking specimens from the throat are shown in the woodcut (Fig. 4), which is about one-half size. After the swab has been rubbed over the throat it is replaced in the tube of thick glass, which is stopped with sterilized cotton. A small piece of this having been previously torn off is moistened with a few drops of water and placed above the stopper to prevent the specimen from drying. The tube is then closed with a cork to prevent evaporation. There should be no delay in taking a swab from the throat, and the treatment should then be applied without waiting for the result of the cultures.

FIG. 4.

I have found it difficult to obtain some common germicides—not only hydrogen peroxide—of the strength which they purport to be. This leads me to emphasize the need of caution concerning the quality of the remedies we employ. Physicians may well take a lesson in therapeutics from the surgeons, for in antiseptic surgery, which is largely therapeutics, they set us an example of painstaking care in the use of remedies that we should do well to follow. If in surgery, where the conditions are comparatively simple, so much pains must be taken, how much more careful should we be when the problem is more complex. When in the selection and application of our remedies we approach the standard antiseptic surgery has set for us, we shall hear less about the inefficacy of drugs.

Diphtheria usually begins on the tonsils, and, to avoid serious consequences—for instance, those resulting from the spread of the membrane to the neighboring air-passages—no moments should be lost before beginning treatment. Until we have found something that will find

and kill all the bacilli at a single blow, any local treatment must be frequently applied to be efficient, as the bacilli reproduce themselves in a very short period. From these frequent applications during the early days of the disease I see, at present, no appeal. The use of the strong hydrogen peroxide solutions reduces the number of applications to a minimum, as the more thoroughly the membrane is disintegrated and removed the less frequent is the necessity for treatment and the shorter its duration.

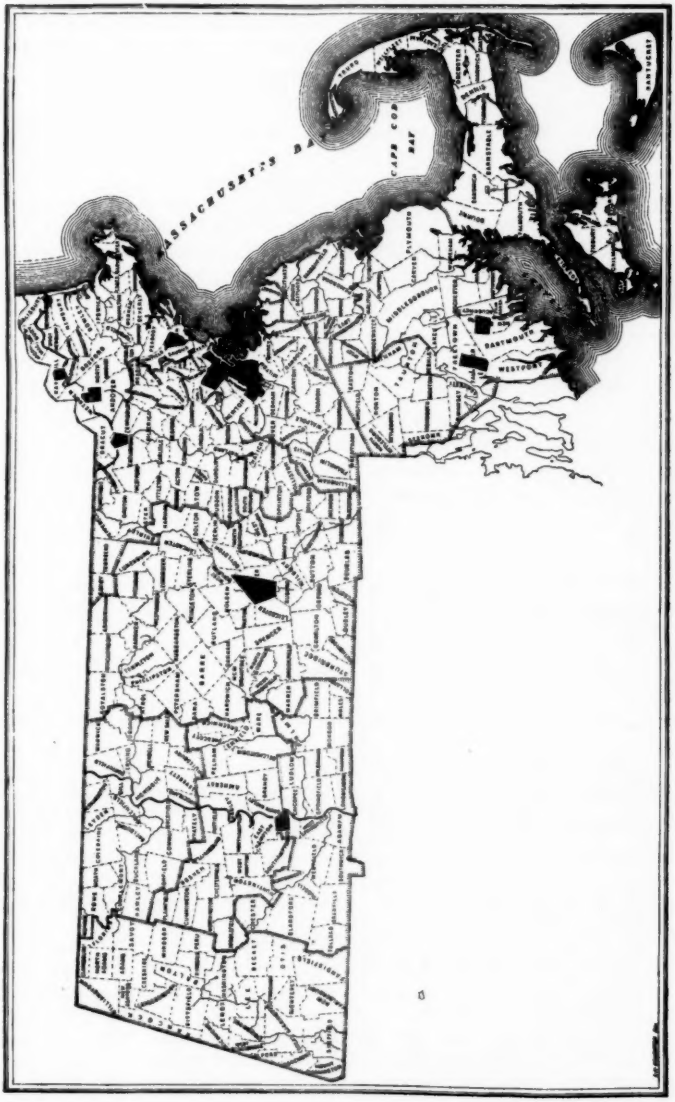
In those cases that are first seen several days after the onset of the disease, and when the patient has become weakened by the poison generated by the bacilli, we must weigh carefully the loss of strength resulting from frequent applications, especially in very young children, against the gain to be derived from the removal or destruction of the bacilli. Further, if the patients have been ill some days when first seen, the chances of recovery are much diminished, and in some cases no treatment as yet at our command is of avail; just when the physician shall renounce all hope of aid from local treatment each one must, of course, decide for himself in the individual case. The usefulness of good local treatment is in direct ratio to the stage of the disease, the accessibility of the membrane, the age and strength of the patient, and the ability of the practitioner to apply it with the least tax on the patient's strength combined with the greatest destruction of the bacilli.

I beg you not to go away from here with the impression that diphtheria can always be cured by strong hydrogen peroxide solutions. I maintain only that when properly used they are more efficient and less harmful than any other treatment I know of. Under their use all of the few cases that I have thus far seen early in the disease, recovered.

As already stated in the opening of this paper, there were 36,553 deaths from diphtheria and croup in Massachusetts from 1871 to 1890, inclusive. Rather more than one-half of these, 19,310, occurred within a very limited area, that is, within the area of the twelve cities, or those fractions of them represented by the nine[1] black spots on the accompanying map. During these twenty years about 43 per cent. of the population was to be found in these cities, and 53 per cent. of the deaths from diphtheria and croup during this time occurred in them. Further, it is of interest to note that the greater part of these deaths occurred during four months of the year, namely, from October to January, inclusive. These are suggestive facts when considered from the standpoint of prevention. It is highly important for each city and large town to have a suitable hospital for contagious diseases, and also to offer facilities for bacteriological examinations in those diseases in which false membranes develop. In smaller communities it would seem desirable to extemporize a hospital during an epidemic.

[1] Four cities—Boston, Cambridge, Chelsea, and Somerville—are contiguous.

Diphtheria seems to me to be chiefly a hand-to-mouth or mouth-to-mouth disease; its cause is tenacious of life, especially in damp places, and is not killed by cold, but is killed by sunlight. The



period of incubation after the bacilli have reached the mucous membrane is probably in some cases not days but hours only. With the improved means of diagnosis at our command, by early isolation, and the co-operation of intelligent citizens with the Boards of Health, it may become one of the most preventable of diseases, and I hope that before many years have elapsed we shall see diphtheria considerably diminished in our State as well as elsewhere. The members of this Society can do much to further this end. The best defence against this disease is educated public opinion.

Summary.

1. The necessity of cultures as a means of early diagnosis.
2. The coincidence of diphtheria and other diseases.
3. The bacteriological examination of all patients ill with scarlet fever, typhoid fever, measles, or other disease, who have membranous throats.
4. The bacteriological examination of specimens from the throats of all diphtheria patients before isolation is ended.
5. Seven and one-half- [known at present in the United States as fifteen-] volume solutions of hydrogen peroxide are weak germicides.
6. The advantages of strong hydrogen peroxide solutions, locally, in diphtheria. The substitution of harmless and more efficient for harmful or inefficient local treatment.
7. The importance of frequent, early local applications.

Note.—Dr. John F. Young, of Newburyport, Mass., was present when this paper was read, and ten days later had a case of diphtheria, in which he used the strong hydrogen peroxide solutions. I heard of it by chance some weeks afterwards, as the patient was the child of an acquaintance. In reply to my inquiries, Dr. Young kindly wrote me about the case. With his permission I quote his letter almost in full:

"My patient was a bright and sensible girl aged ten years. On the morning of the 24th of June she complained of headache and sore-throat; I saw her for the first time about four o'clock that afternoon. There was some stiffness of the neck and some swelling on each side at the angle of the jaw. The tonsils and arches of the palate were red and swollen. There was considerable fever and also a good deal of dizziness when the patient sat up in bed. Small dose of calomel, as bowels were somewhat confined, and boric acid gargle.

"Saw her next morning, 25th, about ten o'clock, when tonsils and arches of palate nearly up to uvula were covered with a thick, grayish exudation, the cervical glands were more swollen, and more constitutional disturbance was present than on first visit. Treatment with peroxide of hydrogen was now begun after evaporating the solution to one-quarter its original bulk; and, as the patient complained of no very disagreeable sensation from its use, it was ordered to be applied in the

form of a spray every hour. Saw the patient again about 7 P.M. There had been no extension of exudation, no other change noticed, except that the exudation looked thicker and more swollen. Directed that spray be used every two to three hours through the night.

"On the morning of the 26th, no considerable change in appearance of throat, no extension, but patient had decidedly less trouble (dizziness) on sitting up, and expressed herself as feeling better. Evening about the same.

"*27th*, A. M. Patches on tonsils and palatine arches appeared to be more loosely attached and also thicker than before. A patch of exudation (rather thin) about the size of a finger-nail, was seen opposite the last inferior molar on right side, and another on the front of soft palate near roof of mouth on left side. The peroxide was now applied by means of a swab and repeated again toward evening by myself, the spray being used as before by the nurse. During the evening on swabbing the exudation in the mouth it seemed to melt away, leaving raw and bleeding surfaces, and the original patches to diminish in size considerably, and on the morning of the 28th it came off almost at the first touch of the swab. The surfaces left bare were raw and bleeding, and a spray of carbolic acid and lime-water was now substituted for the peroxide and used every hour. No reappearance of patches at the evening visit.

"*29th*, A. M. White patches again covered tonsils and arches of palate, not so thick, however, as before, and were removed entirely by two swabbings with peroxide on same day, and did not again return. Spray of carbolic acid and lime-water was continued for the next two days, when one of boric acid was substituted for it.

"By the 4th of July the throat was looking almost well. At this time a slight nasal intonation was noticed, and after this there was some tendency to regurgitation of liquids through the nose. (This became more marked later.)

"It seemed to me that the peroxide had a decidedly beneficial effect, the constitutional symptoms growing less and less every hour from the very start. The general treatment of the patient consisted in the administration of iron, brandy and milk every three hours, and meat juice midway between feedings of milk and brandy."

The noteworthy points in this case are, first, the effect of the local treatment by strong hydrogen peroxide solutions on the patient's general condition; second, the disappearance of the membrane under the use of this application; its reappearance when carbolic acid and lime-water were substituted, and its final disappearance when the strong hydrogen peroxide was resumed.

I wish to express my appreciation of the courtesy and kindness that have been extended to me in the chemical and biological laboratories of the Massachusetts Institute of Technology, by Professor T. M. Drown and Professor William T. Sedgwick, while I was carrying on some of the investigations connected with this paper.

THE PATHOLOGY AND DIAGNOSIS OF DIPHTHERIA.[1]

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As Dr. Williams has fully considered the clinical side, I shall describe the pathological anatomy of diphtheria and other pseudo-membranous inflammations of the throat, and describe the methods used at the Boston City Hospital in distinguishing between the various diseases in which pseudo-membranous inflammations of the throat appear.

The first description of diphtheria was given by Bretaneau. He described as the special anatomical feature of the disease a pseudo-membrane in the pharynx, which often extended to the air-passages. Trousseau found this description too narrow, and regarded the localization of the disease as of secondary importance. He was the first to recognize its infectious nature, and says that the disease is produced by a specific, definite virus, and death is the result of the poisoning of the system with this virus. Whatever are the local manifestations of the disease, whatever its general form, according to Trousseau, diphtheria is always a definite infectious disease, and one case always arises from a similar case. At the time when Trousseau wrote, in 1860, the disease was less prevalent than at a later period, and appeared in the form of circumscribed epidemics, and sometimes as definite house epidemics. Under these circumstances he was able to trace the infection very easily, and infectiousness appeared to him as the chief and most striking feature of the disease. It afterward became much more difficult to trace the infection in many cases, because since 1860 the disease has gradually become a pandemic, extending over all Europe and America.

With the importance attached to the disease from its gradual and great increase its clinical features received more attention. The pseudo-membrane, which was described by Bretaneau, became regarded as its characteristic feature. In consequence of this all manner of inflammations of the pharynx in which a pseudo-membrane was present were regarded as diphtheritic. It was not long, however, before the pendulum began to swing in the other direction. The histology and the histogenesis of the pathological process connected with the formation of the membrane were closely investigated, and it was found that a fibrinous exudation taking the form of a membrane which could not be distinguished anatomically from true dipththeria, might be produced in a number of ways. It might, for instance, follow wounds and traumas of the pharynx, and in the air-passages it could easily be produced by various irritants, as by the inhalation of the vapor of ammonia. I once saw

[1] Read at the annual meeting of the Massachusetts Medical Society, June, 1893.

the most intense inflammation of the larynx, trachea, and air-passages, with the production of a false membrane extending into the small bronchi, which followed the accidental inhalation of croton oil, which had been placed on the back of the tongue. The patient had been brought into the hospital unconscious in a stage of uræmic coma. A few drops of croton oil were placed on the back of the tongue, and the patient at that moment made an inhalation, and a portion of the croton oil entered into the air-passages. We see the same sort of inflammation produced in other mucous membranes by various irritants. It may be produced in the rectum by the application of ammonia, and in the intestinal canal generally, but particularly in the large intestine, it may be produced in various inflammations due to different bacteria. Not only is the pseudo-membrane found in the throat in cases of diphtheria, but also in other infectious diseases, particularly in scarlet fever.

Before the era of bacteriological investigation there was no way of absolutely distinguishing those cases in which the membrane was the result of an inflammation which might be produced by various causes from those in which it represented the local lesion of a specific infectious disease. It can easily be seen that this would result in the greatest clinical confusion. One clinician would report a long series of cases which he regarded as diphtheria, in which an improved method of treatment brought out by himself was successful in all cases; whereas another would report an almost unbroken series of deaths from the disease. Some cases under any form of treatment ran a mild course, whereas other cases would be followed by death. In the same way infection of other individuals would follow in certain cases, and from a single case an extensive epidemic might arise. Other cases in which anatomically the same lesions were found would not be followed by a further infection. Various methods of distinguishing clinically between diphtheria and other infections with similar anatomical lesions were attempted. Some regarded the greater extent of the pseudo-membranous deposit and its extension from the tonsils to the palate and the air-passages as the distinguishing feature of diphtheria. Many regarded only those cases as true diphtheria in which paralysis was observed after recovery.

In diphtheria, as in many other diseases, perfect clearness in diagnosis only arose after the discovery of the etiological factor. We know now that diphtheria is always associated with the presence of micro-organisms characterized by definite morphological and biological characters. The clinician gladly accepted this method of differentiation, because the attempt to define diphtheria according to its clinical features was so completely shattered. We regard now those pseudo-membranous inflammations as belonging to diphtheria in which the Klebs-Loeffler bacillus is found. When that is not present, no matter what the extent and the character of the local lesions, no matter what the severity of

the symptoms, the disease is not diphtheria. The Klebs-Loeffler bacillus is a small organism not much larger than the tubercle bacillus. Its most striking feature morphologically is its variation in form and its irregularity in staining. The ends of the organism are frequently clubbed, sometimes at one and sometimes at both ends, and in most cases when stained it shows a series of clear spaces along with intensely stained particles. The form and size varies greatly under various circumstances. In different cases, it appears in some much larger and more irregular than in others, and in the same preparation great irregularity may be seen. It grows readily on a variety of culture media and most readily on the modified blood serum first introduced by Loeffler. When cultivated on potato it is much larger and more irregular in form than when grown on any other medium. The organism is pathogenic for a number of animals, especially for young cats and guinea-pigs. In guinea-pigs the most virulent form of the organism will produce death in from thirty-six to forty-eight hours. Like some other organisms there is a marked difference in its virulence. While cultures from some cases will always produce death in thirty-six hours, in others death will not take place for several days; in others again the animal may survive the primary inoculation and afterward die of paralysis after an interval of three or four weeks. In still other cases no results may follow inoculation.

The histology and the histogenesis of the diphtheritic membrane has been closely studied by Weigert and other investigators. The diphtheritic membrane is due to a combination of necrosis and inflammation. The essential factor which determines the production of the membrane is necrosis of the surface epithelium. The necrotic tissue supplies the fibrin ferment and fibrin is formed from the serous exudation which comes in contact with the necrotic tissue: in whatever way necrotic tissue may be produced on a mucous surface we shall have a certain amount of fibrinous exudation in and upon this. The inflammation characterized by the presence of a membrane on the inflamed surface is known as *diphtheritic inflammation*, however it may be produced; it does not necessarily have any connection with the infectious disease *diphtheria*. We see the same thing in other pathological processes. We may have suppuration produced by a large number of bacteria. While each form of suppuration has more or less distinct characters given it by the micro organisms causing it, we cannot easily distinguish between the various forms. We may also have fibrinous pneumonia produced in a number of ways, and we cannot always distinguish anatomically the fibrinous pneumonia produced by the pneumococcus from that produced by the streptococcus and other organisms. If we regarded the suppuration produced by one organism, as the staphylococcus aureus, as a definite, infectious disease, we can see in what confusion we should be thrown in attempting to separate this by its anatomical features from other sup-

purations. The *diphtheritic inflammation* is essentially an anatomical process. The name is one well chosen, because it simply refers to the presence of a membrane which is the common feature. It is, perhaps, unfortunate that the name diphtheria is given to the infectious diseases we are considering, because the name tends to confuse the disease with other pathological processes in which there is also inflammation with the production of a membrane.

In diphtheria the formation of the membrane usually begins in the tonsils, and in most cases the primary infection seems to take place here. Not only do the various crypts and depressions in the tonsils form a suitable place for the lodgment of the bacilli, and their growth, but the protecting mucous membrane is thinner on the tonsil than elsewhere. In some places on the surface of the tonsil the sub-epithelial tissue may be exposed. There is very frequently a mild degree of inflammation of the tonsils, which may lower the resistance of the tissues to infectious organisms. From the tonsils the membrane may extend over the pharynx, the palate, the base of the tongue, and into the air-passages. In the air-passages it may extend from the larynx into the trachea, and even into the ramifications of the bronchi. Sometimes the membrane extends in an almost continuous layer over all these parts. Sometimes only small isolated patches are found. In general, when the large continuous membrane is formed, it is due to confluence of smaller patches. The membrane may be confined to the tonsils, and even to one tonsil, but it generally extends over both. The membrane presents a dirty gray, and in some cases a brownish color, which may vary greatly in its thickness, and may be more or less adherent. After death its connection with the tissue beneath is less firm than in life, and it may be stripped off in large shreds. The adhesion of the membrane to the tissue beneath varies in different places. In the air-passages it is less adherent than in the pharynx, and not infrequently even during life large masses of the membrane may be separated and coughed up. The reason for this difference is found in the anatomical character of the mucous membrane in the two places. In the air-passages beneath the epithelium there is a dense basal membrane which forms a limit to the pseudo-membrane. In the pharynx this basal membrane is not present, or certainly not to the same degree. In the pharynx the tissue beneath the epithelium is involved, and there is frequently a direct connection between the fibrin composing the membrane and the patches of fibrin in the tissue beneath. The membrane also extends down into the crypts of the tissue and into the mucous glands, and in this way it is made more adherent. The epiglottis also shows a varying degree of involvement in the process. There may be only small foci scattered over the surface of this, or the entire epiglottis may be converted into a dense, hard, necrotic mass filled with fibrin. The diphtheritic membrane is

not on the surface of the mucous membrane, but the mucous membrane itself forms a part of it. After removal of the membrane ulcers varying in extent and depth are produced. Vessels are ruptured and small hemorrhages are produced in the tissue beneath. The ulcers vary in depth; sometimes they are superficial, at others they extend for some distance into the tissue. The mucous membrane adjoining the diphtheritic membrane is intensely injected, and there is swelling and œdema of all the affected parts.

On microscopic examination of the membrane itself it is found to be composed almost entirely of fibrin and of necrotic tissue which has undergone fibrinoid metamorphosis. We find in the membrane both small masses of fibrin, which may be recognized as such, and large irregular refractive masses forming a network which has all the essential characteristics of fibrin, as shown by staining. These large hyaline masses are produced by a direct metamorphosis into fibrin of the necrotic epithelium and of the pus cells in the inflammatory exudation. Within the membrane we rarely find any well-preserved cellular elements. In some cases, however, it may contain a considerable number of pus cells. In the tissue beneath the membrane we find evidence of the most intense inflammation. The tissue is swollen, œdematous, and infiltrated with an inflammatory exudation. The bloodvessels are dilated and contain numerous pus cells. The pus cells are also found throughout the tissue, both diffusely scattered and in groups. The necrosis is not directly confined to the surface, but from the surface it extends irregularly into the tissue beneath. The necrosis here is also accompanied with a formation of fibrin, and the fibrin of the membrane frequently forms a direct connection with the fibrin in the tissue beneath, which leads to a greater degree of adhesion. When sections pass through the membrane and also involve the adjacent tissue, it will be seen around the edges that the membrane frequently extends over the unchanged epithelial surface.

All of the lymph glands in the vicinity are enormously swollen, and after death in the majority of cases we find a general lymphadenitis. In certain places the lymph glands are more involved than in others. The lymph glands involved to the greatest extent are the cervical and the bronchial lymph glands, the lymph follicles of the intestines and the mesenteric glands. In the intestines there may be such an involvement of the solitary lymph follicles and Peyer's patches that we may have appearances resembling the beginning of typhoid fever. The spleen is unusually swollen, the liver, kidney, and heart show marked granular and sometimes fatty degeneration. In the kidneys there may be a definite acute nephritis, but this is rarer in diphtheria than in scarlet fever and some other infectious diseases. Lesions in the lungs are constantly found. These lesions consist of bronchitis and areas of broncho-

pneumonia, sometimes very extensive, and more common in the lower posterior portions of the lungs.

On microscopic examination of the tissues we find the lesions first clearly described by Oertel. In almost all the tissues, both those in which macroscopic changes were found and those in which no macroscopic lesions were apparent, we find small areas appearing under low powers of the microscope somewhat like tubercles. These small areas consist in circumscribed necrosis of the tissue cells with breaking up of the nuclei and some formation of fibrin. They are more common and more extensive in the lymph glands than elsewhere. These microscopic foci of necrosis with nuclear fragmentation are the most definite anatomical lesions of diphtheria, probably more so than the membrane. While they are undoubtedly present in other infectious diseases, notably in the liver in cases of typhoid fever, in no other disease than diphtheria are they so numerous and so generally distributed in all the organs.

The lesions produced in animals by inoculation are of the same character as those seen in man. When a small amount of a pure culture of the diphtheritic bacillus is placed beneath the skin of the animal, at the seat of inoculation there is a necrotic fibrinous inflammation. If the skin is removed over a part and the wound is inoculated, a fibrinous inflammation on the surface is produced. The lymph glands are swollen and the same necrotic foci are found in all the tissues which are seen in man. When the inoculation is made on the surface of the conjunctiva or on the pharynx a definite membrane is produced.

In man the action of the diphtheritic bacilli is frequently complicated by the action of other organisms. There are other pathogenic organisms almost constantly present in the mouth, and of these probably the most important are the streptococcus pyogenes and the diplococcus lanceolatus. The staphylococcus aureus was found in our cultures a number of times, but not so frequently by far as the streptococcus. It is uncertain whether the staphylococcus is capable in itself of exciting a fibrinous inflammation with the production of a membrane. In all cases in which a definite membrane was found, either the diphtheria bacilli or the streptococci were found. The fibrinous inflammations due to the streptococci are frequently found accompanying other infectious diseases, or they may be found alone. The streptococcus is certainly an active agent in producing most of the throat affections which are found accompanying scarlet fever and measles, particularly the former, although as we shall see, cases of mixed infection between diphtheria and scarlet fever marked by the presence of diphtheria bacilli are not very uncommon. Although the appearance produced by the two organisms, the diphtheria bacillus and the streptococcus, may be so exactly similar that they cannot be distinguished from one another during the life of the individual, after death, as a rule, we are able to distinguish between them. The

diphtheria bacillus is not a pus-producing organism. It does not have the same power of dissolving the tissue and leading to the formation of an abscess as has the pus organisms. Its action, further, is one almost entirely superficial and does not tend to invade the adjacent tissues. After death in the pseudo-membranous affections of the throat accompanying scarlet fever, the membrane is, as a rule, not so thick and cannot be so readily removed as in cases of diphtheria. It is almost always confined to the pharnyx and has no tendency to invade the epiglottis or the air-passages. The redness and œdema of the surrounding parts are more marked than in diphtheria. Not infrequently definite abscesses are found, either in the submucous tissues or in the lymphatic glands. The organisms reach the lymphatic glands along the lymphatics, and frequently white lines of purulent infiltration of the tissue can be traced from the local lesion to an adjoining lymphatic gland in which the abscess is formed. On microscopic investigation the streptococci are found in great abundance in the tissue. Usually their presence is not complicated with that of other organisms. In other cases, staphylococci may be found with them. When the staphylococci are present abscess formation is usually more common than when the streptococci alone are present. In cases of death from scarlet fever, if the throat lesions are extensive there is nearly always a general infection of all of the organs of the body with streptococci. They are found in pure cultures in the heart, kidneys, spleen, liver, and lymphatic glands. There is good reason to believe that this secondary infection with streptococci is the cause of the nephritis which so often accompanies scarlet fever. In two autopsies on scarlet fever made at the City Hospital, in which there were very extensive throat lesions and general infection with streptococcus, acute nephritis was found. In another case in which no throat lesions were found, there was no nephritis and no general infection with streptococci. The streptococcus is so commonly found associated with scarlet fever that many have thought of the possibility of this organism being the cause of the disease. We think it more probable that it represents simply an accidental infection, the accompanying inflammation of the throat affording it suitable opportunity for development.

After death from diphtheria, the diphtheria bacillus is not found in the various organs of the body. We have never found it either in cultures made from the organs, or by direct microscopic examination. For a long time it has been held that the action of the diphtheritic bacillus was essentially a local one, confined to the place where the membrane was found. Recently, Frosch has obtained the organism in the various organs of the body, in ten out of fifteen cases of diphtheria. The method which he used was to take large masses of the various organs, and smear them over the surface of the culture tube. In this way he

succeeded in getting the organisms in the liver, spleen, kidneys, and heart-blood. Abbott has found that when the diphtheritic bacilli are directly injected into the testicles of the guinea-pig small inflammatory foci are found in the peritoneum and in the omentum which contain large numbers of organisms. In Abbott's cases, however, it would seem more probable that the presence of the organisms in these places should not be regarded as a definite infection of the tissues, but as a local inoculation. The testicle has an abundant supply of lymphatics which pass to the retro-peritoneal lymph glands and anastomose with the lymphatics of the peritoneum generally, and it is extremely probable that the bacilli were directly injected into the places where they were found. In the case in which Frosch found the organism in the tissues, he was only able to do so by using large quantities of the tissue for inoculating the tubes. It is possible that an occasional organism may enter into the blood and may be deposited in the organs, and he obtained them by using large quantities of the material, but this cannot be by any means constant, for the general weight of evidence is entirely opposite to this.

In the course of the investigations on diphtheria there were a number of cases in which mixed infection with diphtheria and other diseases was found. Dr. Williams has reported these cases in full. As might be supposed, scarlet fever was more frequently found associated with diphtheria than any other disease. One of the most interesting cases of mixed infection was that with typhoid fever. That pseudo-membranous inflammations of the throat appear in cases of typhoid fever has long been known; they have been especially described by Wagner. Wagner called attention to the fact that these pseudo-membranous inflammations of the throat accompanying typhoid fever were more frequent when epidemics of diphtheria prevailed at the same time. While it is not at all sure, or even probable, that all the pseudo-membranous inflammations of the pharynx in typhoid fever are due to the Klebs-Loeffler bacillus, this gives at least one positive case in which the organism was found. On the same day cultures were made from a case of virulent diphtheria, from a case of pseudo-membranous inflammation accompanying scarlet fever, and from a case of typhoid. In all three the identical organism was found. Inoculations of guinea-pigs were made at the same time from the cultures obtained from the three cases. All three of the guinea-pigs died within thirty-six hours, and the organisms were recovered from the inoculated animals in all cases. The pseudo-membranous inflammations accompanying typhoid are much more frequent than is generally supposed. That they are not more often recognized clinically is due to the fact that the hebetude of the patient prevents any symptoms of the throat affection from appearing; and this condition usually interferes with a thorough examination of the pharynx. In our experience the membrane is more apt to be found just at the beginning of the

œsophagus on the posterior pharynx wall than at any other place. Like the scarlet fever pseudo-membranes, it is very probable that they are generally produced by the streptococcus, but, so far as we know, no bacteriological examination has been made in these cases.

We have also found the diphtheria bacillus in one case of inflammation of the middle ear following diphtheria, and in two cases of inflammation of the middle ear following measles. In the two cases of measles there was no affection of the throat at the same time. Such cases represent accidental infection with the diphtheritic bacilli analogous to the accidental wound infections with the erysipelas organisms or with the pus organisms. We have had no cases of wound infection with diphtheria bacilli. The organism has also been found in cases of pseudo-membranous angina accompanying measles. Although here, as in scarlet fever, it is most probable that the organism which produces the pseudo-membrane is in most cases the streptococcus.

A great deal of interest has of late been excited by the cases in which, without any pseudo-membranous inflammation of the throat so far as could be seen, the Klebs-Loeffler bacillus has been found. Several such cases have been reported. In his early publication, Loeffler has reported one case in which the bacillus was found without any pseudo-membranous inflammation of the throat, and others have since been reported. It has been supposed in these cases that the disease could be produced without a local lesion. All of these cases, however, have been clinical. We know of no case in which the entire pharynx and respiratory tract, including the nares, has been examined for lesions. The lesions might be slight and could very well escape a purely clinical observation. Cases are not uncommon in which lesions have been found in the respiratory tract alone, and found in the nares alone. There have been a large number of cases of membranous rhinitis reported in which the diphtheritic bacilli have been found. The absence of the pseudo-membrane in the places where it is ordinarily found is by no means a proof that it is not present. All the essential symptoms of the disease—the internal lesions, the paralysis, the circulatory disturbances—are so clearly due, not to the presence of the bacilli themselves, but to a chemical poison produced in the local lesions, that we cannot conceive of a diphtheria without local lesions from which absorption can take place. All the lesions of the disease in the internal organs, including paralysis, are produced by inoculating animals with chemical products of the bacilli just as certainly as by the diphtheritic bacilli themselves.

Like other organisms, the Klebs-Loeffler bacillus varies greatly in virulence. A great deal of interest has been excited by what has been called the pseudo-diphtheritic bacillus. It is known that organisms are found which are apparently in morphology and culture identical with the Klebs-Loeffler bacillus, but which show a decided difference in

virulence. Inoculation of guinea-pigs with these bacilli is followed either by no results at all or by very slight local lesions without any general affection. They have been found in very slight lesions of the throat with a slight pseudo-membrane and without any systemic affection. They have also been found in severe local lesions. There can be little doubt now that this so-called pseudo-diphtheritic bacillus represents simply a modified less virulent form of the diphtheritic bacillus. Abbott has shown that around the seat of inoculation the same lesions are found, though different in extent, which are produced by the virulent organism. The most virulent cultures produce death in guinea-pigs in thirty-six hours, and ranging from this, depending on the virulence of the organism, either the duration of life after inoculation is lengthened or no effects are produced. The throat lesions which are produced by the modified organism may be fully as severe as when the virulent organism is present. In some cases the mildness of the course of the disease may be due, not to a modification of the virulence of the organism, but to lack of absorption. We have found cases in which there was apparently no absorption of the virus, although the membrane may be extensive, and the organism, as tested on guinea-pigs, may have the most virulent character. The patient declares himself well, and the pulse and the temperature are about normal.

There is no doubt that the danger in diphtheria lies chiefly in the absorption of the virus which is produced locally, and this does not take place with anything like the same readiness in adults as in children. This is probably due to the more delicate tissues of the child, its greater vulnerability and possibly a greater facility of absorption. It is very probable, however, that just as there are different degrees of susceptibility of the mucous membrane to the local action of the bacilli, so there are also differences in susceptibility to this systemic poisoning.

There are two methods by means of which diphtheritic bacilli, when present, may be detected. One is by means of the direct microscopical examination of the membrane. Small pieces of the membrane can be pulled off with forceps, or a pledget of cotton may be rubbed over the surface of the membrane, and afterward rubbed directly over coverslips. These are then heated and stained by the usual methods. The staining which we have found uniformly best suited is the Loeffler solution of methylene-blue, consisting of methylene-blue dissolved in a weak solution of caustic potash. The bacilli are frequently present in large numbers; in other cases but few are seen. They may be distinguished by their form alone from the other organisms of the mouth, though there may be organisms present which very closely resemble them in form. As a rule they are not homogeneously deposited over the preparation, but are more apt to be found in small masses and clumps. The organisms with which they are most frequently found associated are the

various micrococci, which may be arranged either in chains or in the staphylococcus form. Along with the micrococci there may be present long or short bacilli varying greatly in size and curved forms. In rare cases they may be found in great numbers unmixed with other forms. As a general rule, the more abundant the various organisms which are found, the less the likelihood of the case being one of diphtheria.

While this method will certainly yield valuable results in the hands of the experienced investigator, there is always a considerable amount of difficulty in distinguishing the diphtheritic bacilli from other organisms. When present in large numbers and arranged in masses they can be readily distinguished, but when very few or single organisms are present it is impossible to distinguish them by form and size alone, and we have no method of distinguishing them by staining such as we have in the cases of tubercle bacilli. A much readier way is found in the methods of culture. In this we have, as the most available method to procure the material for culture, a pledget of cotton closely wrapped around the end of a wire. A number of these wires are prepared, enclosed in test-tubes and sterilized by heating in the hot-air sterilizer. After sterilization they are carried to the wards still enclosed in the test-tubes. The wire is then removed from the tube, and the cotton pledget is rubbed over the membrane. Frequently small pieces of it will adhere to it; then the test-tube is labelled and sent to the laboratory. At the laboratory cultures are made on the blood serum and sugar bouillon which was recommended by Loeffler. This is prepared in large quantities and kept on hand. It consists of blood serum obtained from the slaughter-house and mixed with one-fourth its volume of bouillon containing 1 per cent. of grape-sugar. This is then poured into test-tubes, from 10 to 15 c.c. being placed in each one, and these are then sterilized in a leaning position to give a large extent of surface. At first we always used the fractional sterilization, heating the material on successive days up to a temperature of 62°. So many of the tubes spoiled, however, that lately we have adopted the plan of heating it at once up to the boiling temperature, and then sterilizing it on successive days, just as we would with any other medium. The heat coagulates the blood serum and renders it opaque. The organisms grow on it with great readiness, and the opacity interferes very little with the proper recognition of the colonies. We have tried various media, human blood serum among others, but the organisms grow very much more readily upon serum derived from cattle than upon any other medium. The pledget of cotton on the end of the wire is rubbed over the slanting surface of the test-tube, which is then placed in a warm chamber. At the end of twenty hours, if diphtheritic bacilli are present an abundant growth will be found on the surface of the test-tube. The organisms grow as small isolated colonies, frequently scattered over the surface.

Of course the swab from the throat contains in almost all cases numerous other organisms, as well as the diphtheritic bacilli, and if all these organisms grow equally well it would be impossible to distinguish the different species. Fortunately, however, but few of the organisms found in the throat find suitable conditions for their growth in our ordinary modes of culture. The diphtheritic bacilli may be found alone, but usually other forms, both micrococci and bacilli, are found with it. The micrococci are usually the diplococcus lanceolatus, streptococci, and staphylococci. Streptococci are more frequent than other forms. One of the most common bacilli found is a short organism growing in pairs with pointed extremities. There is nothing absolutely characteristic of the macroscopic appearance of the growth of the diphtheritic bacillus in these primary cultures, although pure cultures on test-tubes made from these primary cultures are more characteristic. It is impossible to tell by the macroscopic appearance the colonies of diphtheritic bacilli from the colonies of both streptococci and staphylococci. After twenty to twenty-four hours the cultures are removed from the culture chamber and the various colonies are examined microscopically. The masses of bacilli in the colonies are recognized in this way much more easily than by the simple direct examination of preparations made from the throat. In doubtful cases it is always well to make inoculations on animals.

There can be no doubt of the importance of such investigations. When we can make a perfectly definite diagnosis, we know what we are doing; we know that in certain cases we have to do with the true diphtheritic organism, and in other cases with only a mild and possibly non-infectious organism. It is impossible to separate the cases of diphtheria from other pseudo-membranous inflammations in any other way. We know that cases in which the virulent organism is found may run a very light clinical course, and without the presence of the bacillus we might not think it necessary to guard against infection. In the absence of a definite diagnosis made by bacteriological investigation, the only safe way is to consider every case in which pseudo-membranous inflammation of the throat is found, whatever its character, however mild the clinical symptoms may be, as a case of true infectious diphtheria.

Of late considerable attention has been given to the pseudo-diphtheritic, or, as they have been called, the diphtheroid affections of the throat. By this we do not mean cases of pseudo-membranous inflammation simulating the pseudo-membranous inflammations found in diphtheria, but other inflammations of the throat in which the appearances simulate a pseudo-membrane. Too frequently in practice every sort of white deposit and discoloration in the pharynx is regarded as a membrane. The membrane found in the membranous inflammation is perfectly distinct anatomically, whatever may be its etiology. It is always dense and firm and is made up of fibrin and degenerated cells.

In the diphtheroid inflammations we may have masses of detritus consisting of cast-off epithelium, mucus, and masses of bacteria collected on the surface of the mucous membrane, and frequently extending into the follicles. This can easily be told from the membranes, because on touching it with the needle, the latter sinks into it, and it can be removed, not as a membrane, but as a more or less granular mass. Examining under the microscope the whitish deposit is frequently seen to be composed almost entirely of masses of bacteria of the most varied forms. We find it in quantities of bacteria, spirilla, and micrococci. It is evident that these organisms find in the collections of mucus and cast-off epithelium a suitable culture media, and they grow and develop in this. Sometimes these deposits are accompanied by considerable swelling, irritation and other evidences of inflammation; and when removed there may be here and there a very slight fibrinous inflammation beneath them. It is not uncommon to have a high fever and considerable constitutional disturbance in these cases, but the condition runs its course in a few days, and is attended with but little danger.

RIFLE PRACTICE IN ITS RELATIONS TO EYE-STRAIN.

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Since rifle practice has become a matter of such vital interest to the officers and enlisted men of the United States Army and National Guard, its causative relation to eye-strain has assumed an importance that demands more attention on the part of the medical staff of both services than has heretofore been devoted to it. Hence, it has appeared *à propos* to the writer to attempt a discussion of the matter, pointing out the dangers of the present system so far as the eye is concerned, and advising such a modification of the system as shall be less likely to cause ocular trouble in the future.

This subject will be discussed under the following heads: I. The defects of the present system in its relation to eye-strain. II. In what respects the present system should be modified.

I. THE DEFECTS OF THE PRESENT SYSTEM IN ITS RELATION TO EYE-STRAIN.

1. *As regards the color of the targets.*

The color of the targets, used in known distance firing, is a light buff, the bull's-eyes and rings being black. Light is reflected from these

targets with almost as much intensity as from a white surface, and no one can realize the dazzling effect produced unless he has faced such a target for several hours under a bright sun. Then, when we remember that the soldier, or officer, as the case may be, is required to aim at this bright surface, and, in the effort to properly adjust the sights of his rifle upon the target, strain his accommodation in the face of the glare, it is a matter for wonder that even more eyes have not succumbed to such cruel and unwise treatment, which sets at utter defiance the laws of ocular hygiene. At most of our frontier military posts, as well as at the majority of the target ranges of the National Guard, the glare during the target season is intense, and especially is this the case at the posts located in Indian Territory, Texas, Arizona, and New Mexico. In the two last-mentioned Territories, the target ranges—with the whole face of the country, for that matter—are destitute of trees, and, during the target season the ground and the targets are of the same buff tint, with scarcely a trace of verdure to relieve the eye. Imagine one practising at a light-buff target under these circumstances, with the bull's-eye dancing in the brilliant sunlight as if bewitched! In the case of the scorers, and of the officers in charge of the practice, the inconvenience resulting from gazing intently at these blazing targets is second only to that experienced by the soldiers engaged in firing. Some officers have attempted to secure protection from the intolerable glare by the use of smoked glasses; but this partial relief is denied the marksman, as he must make use of the full amount of his visual acuteness in order to fire with the best result. Under such circumstances, any masked refractive error is very prone to manifest itself, with the accompanying symptoms of eye-strain. Such treatment is injurious enough to the normal eye, but it is especially hurtful to the hypermetropic or astigmatic organ.

2. *As regards the damage done to the eyes in cases of refractive error.*

In this connection it seems advisable, as a preliminary, to explain, in a manner that may be easily understood by the general practitioner, what is meant by the terms *far point, near point, visual acuteness, accommodation, emmetropia, myopia, hypermetropia,* and *astigmatism,* as a proper appreciation of the meaning of these terms, as well as of the refractive conditions indicated by the last four, is necessary to the clear understanding of the discussion contained in the following pages.

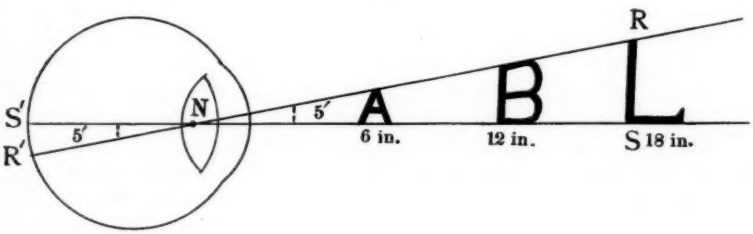
a. The *far point* is that point for which the eye is adjusted when *the accommodation is at rest.*

b. The *near point* is that point for which the eye is adjusted when *the full power of accommodation is called into play.* For instance, if an individual can distinguish fine print at a distance of eight inches from the eye, but no nearer, then the *near point* of such an eye is at *eight inches.*

c. Visual acuteness is "the power of recognizing form," and the standard adopted by oculists is the power of recognizing an object that subtends an angle of five minutes (5′) at the nodal point of the eye.

In Fig. 1, the point N in the crystalline lens is the nodal point, and the rays RR′ and SS′, which come from the extremities of the letter L, intersect at this point, and the angle RNS (= R′NS′) formed by them at N, is the angle subtended by the letter. An eye that can recognize an object which subtends an angle of five minutes at the nodal point is said to possess the normal acuteness of vision. In the figure, it is evident that the other letters, A and B, subtend the same angle. It requires the same degree of visual acuteness to recognize A at 6 inches, B at 12 inches, and L at 18 inches. It must be distinctly understood that *the possession of the normal acuteness of vision, as indicated above, does not exclude the possible existence of errors of refraction.*

FIG. 1.



d. Accommodation may be defined as the power possessed by the eye of altering its focus, as may be necessary, for the proper perception of near objects. By the exercise of this power, the refraction of the eye is increased, and near work made possible. Accommodation is due to a little muscle in the eyeball, called the ciliary muscle, which, by its contraction, draws forward the choroid, and thus relaxes the suspensory ligament, or zonula of Zinn, in consequence of which relaxation the inherent elasticity of the crystalline lens is enabled to assert itself with a resulting increase in the convexity of the latter. This increase in the convexity of the lens enables rays of light, emanating from near objects, to be properly focussed upon the sensitive elements of the retina. In the ideal, or normal, eye no accommodation is required for objects at twenty feet or beyond, since, in practical ophthalmology, rays coming from this distance are considered to come from infinity, and, hence, to be parallel, and the theoretically perfect eye is adapted to such rays. This is not true, however, of the eye whose refraction is *not* normal, as will be explained later on. The amount of accommodative effort necessary for distinct vision within infinity (twenty feet), and the distance of the object

from the eye are inversely proportional—the shorter the distance the greater the accommodative effort.

The power of the accommodation does not remain fixed through life, but at the age of ten years begins to decline rapidly and regularly until it reaches the zero limit at seventy-five years of age. The following table gives the power of accommodation possessed by the eye at different ages.[1] The letter D means "dioptre," and signifies the refractive power possessed by a lens of one metre (about forty inches) focal length, which is the standard lens of the metric system. This system of designating lenses (metric system) is now almost universally used by oculists, instead of the old inch system:

Years.	Power of Accommodation.
10	14 D.
15	12 D.
20	10 D.
25	8.5 D.
30	7.0 D.
35	5.5 D.
40	4.5 D.
45	3.5 D.
50	2.5 D.
55	1.75 D.
60	1.00 D.
65	0.75 D.
70	0.25 D.
75	0.00 D.

The excuse for the insertion of this table is the fact that it will be necessary to refer to certain data contained in it at a later phase of this discussion.

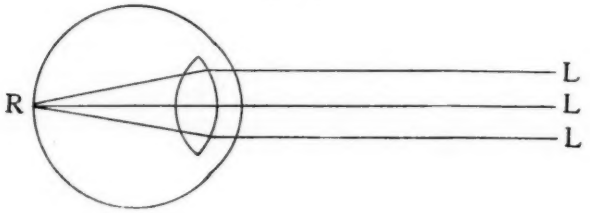
It may be well to state here that this failure of the accommodative power with increasing years is due to the fact that the elasticity of the crystalline lens progressively diminishes, as a result of which the contractions of the ciliary muscle are not followed by a commensurate increase in the convexity of the lens. In certain refractive conditions, to be explained further on, distinct vision, for both distant and near objects, is possible only at the expense of an habitually increased accommodative effort, by means of which the individual is enabled to overcome his refractive error and obtain the normal acuteness of vision. This statement applies to errors of moderate degree in comparatively young subjects.

e. Emmetropia is the theoretically normal state of refraction, and may be defined as that refractive condition which, with the accommodation at perfect rest, permits of the focussing of parallel rays of light upon the

[1] See Landolt: The Refraction and Accommodation of the Eye, p. 178.

retina, or, in other words, the retina is situated at the focus of the dioptric system of the eye. Such an eye is adapted to *parallel* rays, and the far point is at infinity. This condition is illustrated in Fig. 2.

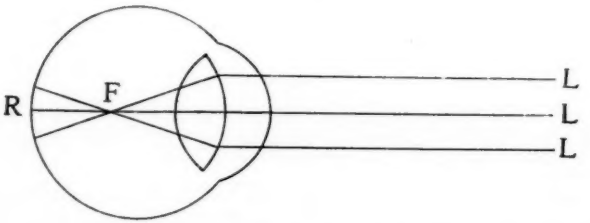
FIG. 2.



Parallel rays, L L L, are brought to a focus upon the retina at R. In this and the following refractive conditions it is assumed that the accommodation is at perfect rest, the *static refraction* being meant.

f. Myopia (near-sight) is that state of the refraction which causes parallel rays to be focussed *in front of the retina*, or the retina may be said to be *behind the focus* of the dioptric system, as shown in Fig. 3.

FIG. 3.

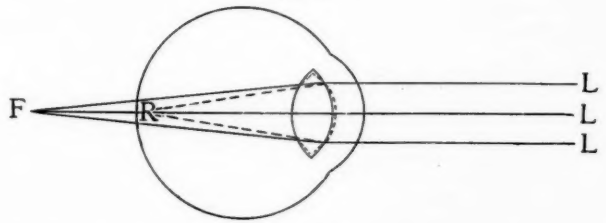


In myopia the eyeball is virtually *too long* in its antero-posterior diameter. Such an eye is adapted to *divergent* rays, and its *far point* is at a finite distance *in front of* the cornea, and positive.

g. Hypermetropia (far-sight) is that refractive condition in which parallel rays are focussed at a point *behind the retina*. The retina is *in front of the focus* of the dioptric system of the eye. The hypermetropic eye is adapted to *convergent* rays, which do not exist in nature, and hence accommodation is necessary for all distances, both far and near, since by this means alone can parallel or divergent rays be given the proper degree of convergence to be focussed upon the retina. In Fig. 4 the focus of the dioptric system is at F, a point behind the eyeball, and the parallel rays, L L L, are represented as focussed at this point. The dotted lines show the direction that these rays should take in order to

be focussed upon the retina at R, and the dotted curve represents the change in shape of the crystalline lens, under the influence of the contraction of the ciliary muscle, necessary to give the rays, L L L, the required direction.

Fig. 4.



The hypermetropic eye is *too short* in its antero-posterior diameter, and its *far point* is *behind* the eye, and negative.

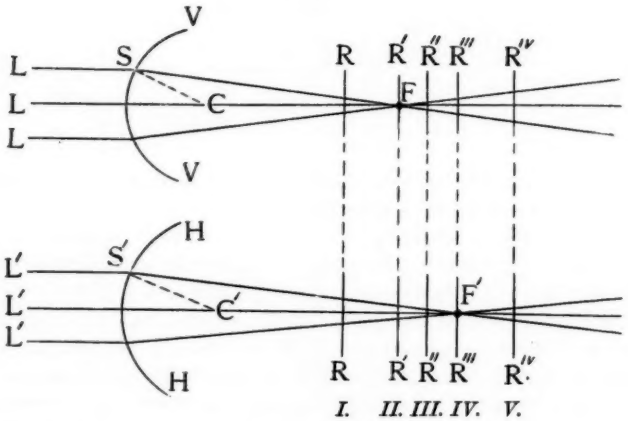
h. Astigmatism (ἀ, privative; στίγμα, a point) is that refractive condition in which the different meridians of the refractive apparatus have different powers of refraction, and hence the rays of a cylinder of light entering the eye are not brought to a focus at *one point*. This condition is due to a *difference in curvature of the meridians of the cornea*. The meridians of *greatest* and *least* refraction, called *principal meridians*, are at right angles to each other, and the refractive power of the intervening meridians diminishes gradually from that of the meridian of *greatest* to that of the meridian of *least* refraction. This constitutes *regular astigmatism*, which falls within the scope of this paper. It can readily be understood that rays passing through the meridian of *greatest* refraction will be brought to a focus *sooner* than those passing through the meridian of *least* refraction. This, while seemingly abstruse in the telling, can be readily understood by referring to Fig. 5.

Regular astigmatism is subdivided into five varieties, which are individually determined by the relative positions of the retina and of the foci of the principal meridians. From what has been said of the relative positions of the retina and foci of the dioptric system in hypermetropia and myopia, the reader should have no difficulty in comprehending the different varieties of astigmatism as exemplified in Fig. 5 (which is an adaptation from Landoldt).

A single curved surface is here used to represent the refractive apparatus of the eye. Let VV represent the vertical meridian, and be the meridian of *greatest* curvature, with the centre of curvature at C; parallel rays (L L L) will be focussed by this meridian at F. Now let HH be the horizontal meridian of the same curved surface, and let it represent the meridian of *least* curvature, the centre of curvature being at C'; then parallel rays (L' L' L') will be focussed by this meridian at F'. It is

seen from the figure that the focus F is nearer the refracting surface than is the focus F′. Of course, the planes of the two meridians, VV and HH, are at right angles to each other. Such a condition in the human eye constitutes astigmatism. As before mentioned, the position of the retina with reference to the foci of the two principal meridians determines the special variety of astigmatism in each case.

Fig. 5.



Returning to our figure, let the screens RR, R′R′, R″R″, etc., represent the retina as it occupies positions *I.*, *II.*, *III.*, etc. Now, if we place the screen at *I.* (so that it occupies the position indicated by RR), we find that it is *in front of the foci* of both meridians; hence, both meridians are *hypermetropic*, though in *different* degrees, and we have an illustration of *compound hypermetropic astigmatism*. Place the screen (R′R′) at *II.*, and we find that it *corresponds with* the focus (F) of the *vertical* meridian, which is therefore *emmetropic*, but is still *in front of* the focus (F′) of the *horizontal* meridian, which is consequently *hypermetropic*. Here we have an illustration of *simple hypermetropic astigmatism*, in which one meridian is *emmetropic* and the other *hypermetropic*. At *III.* the screen (R″R″) is *between the foci* of the two meridians, that of the vertical meridian being in front of it, and that of the horizontal meridian behind it; hence the former meridian is *myopic* and the latter *hypermetropic*, and our figure illustrates a case of *mixed astigmatism*. With the screen (R‴R‴) at *IV.*, it *corresponds with* the focus (F′) of the meridian of least curvature, and is behind the focus (F) of the meridian of greatest curvature, giving us an example of *simple myopic astigmatism*, in which the former meridian is *emmetropic* and the latter *myopic*. If we move our screen ($R^{IV}R^{IV}$) still further from the refracting surface, and

let it occupy position *V.*, it will be *behind the foci* of both principal meridians, and we have a representation of *compound myopic astigmatism*, in which both meridians are *myopic*, though in different degrees.

To recapitulate:

I. represents compound hypermetropic astigmatism.
II. " simple hypermetropic astigmatism.
III. " mixed astigmatism.
IV. " simple myopic astigmatism.
V. " compound myopic astigmatism.

I shall now attempt to make an application to target practice of the facts stated in the foregoing remarks upon refraction and accommodation. From what has already been stated, it can readily be seen that the emmetrope, possessed of normal visual acuteness, can, in aiming at the target, see the bull's-eye distinctly with the accommodation perfectly relaxed, but must make use of his accommodation in order to secure accurate perception of the front and rear sights of his rifle, which are situated at finite distances from the eye. I have determined, by experiment, that the average distance of the eye from the *front* and *rear* sights of the United States Springfield rifle, when firing in the standing or sitting positions, is 110 cm. for the former and 43.1 cm. for the latter —an accommodative effort, therefore, of 0.90 D. being required in the one case, and 2.32 D. in the other. Under proper conditions of ocular hygiene, the emmetropic eye should experience no trouble from constantly bringing this amount of accommodation into play, but, when its use becomes necessary in the face of a dazzling target, matters are decidedly changed. The effect is very similar to that experienced when one attempts to read a newspaper in the bright sunlight, or look fixedly, under the same conditions of light, at a dark object on a whitewashed wall. Such use, even of the normal eye, if continued from day to day, and for an hour or two at a time, for several weeks, will be very apt to bring on serious symptoms of eye-strain; accommodative asthenopia, and congestion of the retina and other structures in the interior of the globe, resulting. Yet this is exactly what the soldier in the United States Army is required to do during the "target season."

In hypermetropia and astigmatism trouble is far more likely to result from this constant firing at the present brilliant target than in the case of emmetropia, just mentioned, for the simple reason that more accommodative strain is required in these refractive conditions.

As before explained, in the case of the hypermetropic eye, accommodation is necessary *for all distances*, the amount of accommodation required in any given case being dependent upon the degree of the refractive error and the distance of the object viewed from the eye. In looking at the target, which the emmetrope can perceive distinctly without use of his accommodation, the hypermetrope is required to bring

into play enough accommodation to overcome his error (or, in other words, to give to parallel rays the degree of convergence necessary to their accurate focussing upon the retina) before he can see the bull's-eye. Furthermore, in adjusting his refraction to the sights of his rifle, the hypermetrope must, in each case, make use of this amount of accommodation (*i. e.*, an amount sufficient to overcome his error) over and above that required by the emmetrope under like conditions. In other words, a hypermetrope of 2 D. must constantly make use of 2 D. of accommodation in excess of the amount necessary for the emmetrope.

Much greater strain is placed upon the ciliary muscle in astigmatism than in hypermetropia. Of course, distinct vision without glasses is only possible in the lower degrees of astigmatism, and it is of such degrees that these remarks are made. In order to overcome an astigmatism and secure distinct vision, when such a result is possible, certain segments, or zones, of the ciliary muscle must contract more strongly than others, producing in this way a condition of artificial compensatory lenticular astigmatism, if I may be permitted the coining of such an expression, which is the converse of the refractive condition of the cornea, and hence neutralizes the effect of the latter. Of course, the crystalline lens becomes most convex in the direction of the most strongly contracting segment of the ciliary muscle. Since the hypermetropic forms of astigmatism are the kinds almost invariably found in soldiers, the following remarks apply to these varieties alone, mixed astigmatism and the forms of myopic astigmatism being excluded.

This neutralizing of the corneal astigmatism by irregular contraction of the ciliary muscle, as above explained, is, in the case of the soldier affected with hypermetropic astigmatism, necessary in order that he may focus parallel rays upon the retina, or, in other words, see distinctly at twenty feet or beyond. Hence, before he can see the bull's-eye, he must thus *overcome his error*, and must, *in addition*, bring into play a general (or regular) contraction of the ciliary muscle, as explained in the case of the hypermetrope, sufficient to enable him to see the sights of his rifle.

From the above description it can easily be understood why the astigmatic soldier is so much more liable to suffer from eye-strain, as a result of rifle practice, than the emmetrope. What was said of the direct effect upon the emmetropic eye of constant firing at the present target applies, therefore, with far greater force to the astigmatic and hypermetropic organs.

So far, it has been assumed that the individuals affected with ametropia have been possessed of sufficient accommodation to overcome their respective errors; but the factor of age must now be taken into consideration. It has already been stated that, owing to a progressive diminution in the elasticity of the lens, the accommodative power diminishes

rapidly and regularly from the age of ten years, when it amounts to 14 D., to that of seventy-five years, when it becomes zero. By referring to the table given on a preceding page, it can well be understood how a soldier of twenty or twenty-five years of age, when the accommodative power is 10 D. and 8.5 D. respectively, might easily overcome an error of refraction which would cause great strain of the ciliary muscle, or be insurmountable, by the time he reaches the ages of thirty, thirty-five, or forty years, when the amplitude of the accommodation falls to 7 D., 5.5 D., and 4.5 D.

It is especially in the younger soldiers, who have moderate degrees of refractive error not incompatible with distinct vision under accommodative effort, that we may expect to find asthenopia. By the time these subjects reach the age of twenty-five years any strain of accommodation is almost sure to cause trouble, for by that time the accommodative power having fallen to 8.5 D., is no longer able to overcome their errors *and leave enough accommodation in reserve for constant work.* It is a fact well understood by ophthalmologists that, for constant use, a certain proportion of the total range of accommodation (about one-third or one-fourth)[1] must be left in reserve, and that all the accommodation can no more be brought into play and kept constantly engaged without fatigue than can any other muscular power.

Now, our soldier of twenty-five years having been during the whole of his previous life accustomed to distinct vision, his visual centres will not brook any dimming of visual perceptions, but demand sharply cut retinal images, and hence the flagging ciliary muscle is spurred on to greater and greater efforts, until severe eye-strain results. In the higher degrees of ametropia (such as would not be likely to be found among soldiers, owing to the examination for enlistment), vision never having been distinct, so much is not required of the ciliary muscle; hence, eye-strain is not so liable to come on. In these cases the visual centres content themselves with the impressions received from the circles of diffusion formed on the retina, and do not realize the need of accurate focussing.

Now, while upon this subject, another element must be touched upon, namely, the part played by the extrinsic eye-muscles in the production of the composite condition called eye-strain. In refractive errors the normal balance between the ocular muscles is not as well sustained as in emmetropia, and, as a consequence, the so-called muscular asthenopia is very prone to occur under conditions of unwise use of the eyes. This condition of muscular asthenopia results in these cases from a disturbance of the normal relations existing between the functions of convergence and accommodation. When this condition is induced in an

[1] See Landolt: The Refraction and Accommodation of the Eye, p. 339.

ametropic individual the state of such a person is far from pleasant. All near work becomes painful; headaches, pain in the back of the neck, dizziness, nausea, and other disagreeable symptoms soon follow any special use of the eyes.

I can speak feelingly on this point, since, in consequence of a season of target practice in 1883, when I stood number one in order of merit in a post garrisoned by headquarters, band, and five companies of the 14th United States Infantry, I developed a condition of muscular asthenopia (insufficiency of the internal recti muscles) which gave me the greatest annoyance for several years. I am a hypermetrope to the extent of 1.50 D., but was not aware of this fact until the eye-strain developed just after the target season mentioned.

Myopia is not frequent among the soldiers of the regular Army; indeed, I have never seen a myopic enlisted man whose error was greater than 1 D.; but myopes must be comparatively common among the members of the National Guard, of whom a preliminary physical examination is not usually required. Hence the following statements concerning the effects of "target practice" upon the myopic eye apply especially to the latter organization.

In myopia, vision for distance cannot be improved by accommodative effort, since, even with the accommodation at rest, the dioptric system of the myopic eye is *already too highly refractive*, and rays of light coming from twenty feet or more (parallel rays) are focussed in front of the retina, and then projected upon this structure in circles of diffusion. The myope, therefore, only calls upon his accommodation for distances *within his far point*, which is situated at a finite distance in front of the eye; consequently he habitually makes use of less accommodation than the emmetrope, by the degree of his refractive error. Thus, to read fine print at 33 cm. would require in the emmetrope about 3 D. of accommodation ($\frac{1}{3}\frac{\text{m.}}{3\text{cm.}} = \frac{100}{33} = 3$ D.), whereas, in the case of a myope of 2 D., for instance, only 1 D. would be necessary to do the same work (3 D. — 2 D. = 1 D.); in the case of a myopia of 3 D., no accommodation at all would be needed for this distance (33 cm.), since the individual's *far point* would be at exactly this distance from the eye ($\frac{100}{3} = 33$). In consequence of this diminished use of the ciliary muscle, we find this structure flatter and less strongly developed in myopia than in emmetropia, the circular fibres of the muscle, which are supposed to have most to do with accommodation, being especially defective.[1]

A myope of even 1 D. cannot see the bull's-eye distinctly, distinct vision for distance in this refractive condition being only possible with the aid of concave lenses.

[1] See Fuchs: Text-book of Ophthalmology, pp. 635 and 636.

The ranks of the National Guard being recruited, as a general thing, from an intelligent class, it is a rule that the myopes of this organization are aware of their ocular defects, and have the same corrected by proper glasses, so that this part of the discussion is narrowed down to the effect of "target practice" upon the myopic eye provided with the proper correction.

Concave glasses, as is well known, call accommodation into play—the stronger the glass the greater the accommodative effort—and frequently myopes, whose accommodative power is not what it should be, cannot stand the full correction, even for distance. Every oculist has frequently in these cases to *under-correct*, and, moreover, even in moderate degrees (about 4 D.), to prescribe still weaker concave lenses for near work, for although, theoretically, myopes of about 4 D. and less are supposed to use this correction for near work as well as distance, practically many patients cannot stand the increased accommodative effort necessary in the former case. Hence, such persons are provided with two pairs of glasses—one for distance, and a weaker pair, adapted to the patient's working distance, for near work.

Now, to return to our myopic soldier: suppose him to be moderately myopic, and to wear his full correction in order to see the bull's-eye. Of course, he cannot make use of one pair of glasses for the bull's-eye, and another weaker pair for the sights of his rifle, but must use his full correction for all. Hence, it can well be understood that his poorly developed ciliary muscle may prove unequal to the task when firing at a brilliant target, and accommodative troubles result, as described in the case of the emmetrope. Muscular asthenopia is also apt to occur, but far greater dangers than these menace the myope whose eyes are abused.

Myopia is essentially an acquired condition, being rarely congenital. In the immense majority of cases infants are born hypermetropic. The late Dr. Ely, of New York, examined with the ophthalmoscope the eyes of one hundred infants, and found that nearly all of them had "the short eyeball."[1] The same results have been obtained by other observers. Now, if at birth the eye is, as a rule, hypermetropic, how is it that myopia is induced, or, in other words, what causes the faulty elongation of the globe?

It is the universal opinion of ophthalmologists that the cause of this acquired myopia must be attributed to the constant demands made upon the eyes by near work. In the first place, it is assumed that in such cases there is an adherent anatomical weakness in the posterior pole of the globe, principally located in the sclera, which fact would render the eyeball prone to elongate in this direction, if subjected to lateral com-

[1] See Valk: Errors of Refraction, p. 44.

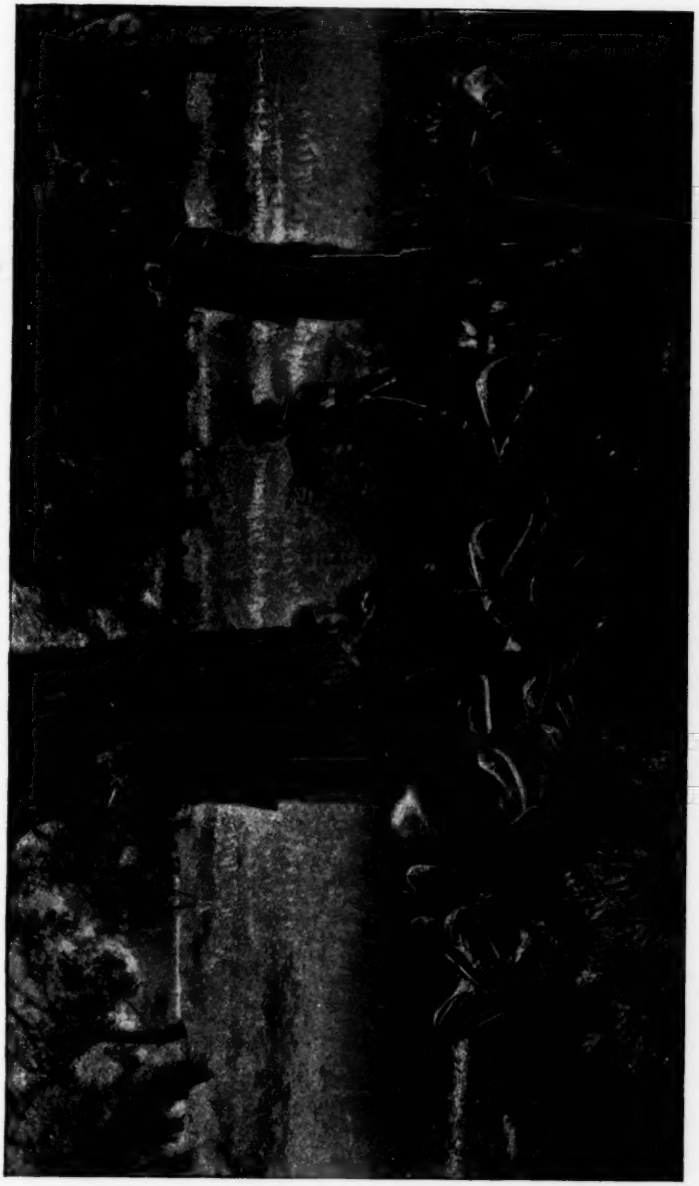
pression, or if from any other cause the intra-ocular pressure should be somewhat increased.

Now, in the production or increase of this ectasis at the weakened posterior pole, no matter in what way this weakness may have been induced, we find the following active agents: 1. The extrinsic ocular muscles, notably the four recti, which, when even in their accustomed state of tonic contraction, press upon the globe, but whose action in this regard is greatly increased in the act of convergence for near work. Moreover, the superior and inferior oblique muscles, encircling the globe as they do, compress it at its equator, and thus press upon the points of exit of some of the venæ vorticosæ with a resulting turgescence of these vessels in the choroid, and a consequent increase of the intra-ocular pressure.[1] 2. The exercise of the accommodation, which is held by many authorities, notably Landolt, to increase the intra-ocular pressure. 3. A faulty position of the head and body (as in bending forward in near work, or using the eyes while in the recumbent posture) which causes a condition of hyperæmia in the interior of the eyeball, both from increased flow of blood to the organ and from the compression to which the veins in the neck are subjected, with a resulting increase in the intra-ocular pressure.[2] It can also be well understood how harmful the congestion thus induced would be in case the choroid should be diseased or there should be a commencing posterior sclerotico-choroiditis. 4. Improper illumination, either *insufficient* (in consequence of which the work is held too near at hand, and the convergence and accommodation increased to a harmful degree), or *too brilliant* (causing irritation of the eye and rendering the internal structures hyperæmic), or *badly directed*, as, for instance, light shining directly into the eyes, in consequence of the source of light being in front of the individual, which, when conjoined with increased brilliancy, intensifies the bad results of the latter. 5. The traction exercised upon the weakened posterior pole by the optic nerve in strong convergence (Fuchs). In the act of convergence the posterior pole of the elongated globe is turned outward to a greater degree than in the case of the normal eye, and, as a result, the counter-traction of the optic nerve tends to still further increase the ectasis.

Now, place our myopic guardsman, provided with his proper correction, in front of the target and apply the above facts to *his* case. In the *first* place, he has in front of him a bright glaring target, at which he must aim (radically improper illumination); in the *second*, his eyeballs are compressed by the ocular muscles in producing the convergence called for when he attempts to focus the sights of his rifle, especially the rear

[1] See Fuchs: Text-book of Ophthalmology, p. 639.
[2] See Hartridge: On Refraction, p. 145.

FIG. 6.



sight (for, although one eye may be covered by the lid, it will, nevertheless, turn inward from sympathy with the uncovered organ); in the *third* place, by reason of the increased accommodation rendered necessary by the correcting lenses worn, the intra-ocular pressure may still further be increased; and in the *fourth* place, by his head being bent forward and turned sideways (generally to the right), in the act of aiming at the target, the bad results of faulty position (congestion of the intra-ocular tissues, both from increased flow of blood to the interior of the eyeball and from pressure upon the veins in the neck) are induced.

Could our myope be placed under conditions much more unfavorable? If he has a tendency to choroidal disease, this may be precipitated; a slumbering posterior sclerotico-choroiditis may be aroused into pernicious activity, with the result of rendering his myopia progressive; asthenopia, both accommodative and muscular, may be caused; and, finally, in older subjects with a high degree of error and fluid vitreous, it is remotely possible that detachment of the retina may ensue.

From what I know of target practice, after over fourteen years' experience as a member of the Medical Corps of the United States Army, I would not advise myopes of a greater degree of error than 2 D. to engage in this military duty.

From what has already been stated, it can easily be understood how the various recumbent positions in long-range firing under the present system of target practice are radically wrong from an eye standpoint. The least objectionable is the *prone position*, since in this the veins in the neck are compressed to a less degree than in the various back and side positions, and hence there is in the former case less consequent congestion of the intra-ocular tissues. The back and side postures are especially injurious, as the reader can easily imagine if he will examine the accompanying illustration, which shows the various permissible positions in target practice as at present conducted in the United States Army. This illustration is copied from a photograph, the work of Captain Sumner Lincoln, of the 10th United States Infantry, to whom I am indebted for the same.

II. IN WHAT RESPECTS THE PRESENT SYSTEM SHOULD BE MODIFIED.

In the first place, the color of the targets should be changed by all means, and the element of glare reduced to a minimum. This can easily be effected by making the *body of the target black* and the *bull's-eye and rings buff*. By this simple change the reflection of light from the target could be almost entirely obviated, since the only visible reflecting surface in this case would be the bull's-eye. Everyone knows that the *black target will absorb light*, instead of *reflecting* it. Another gain in this change would be the greater contrast produced between the color of the

target and the face of the landscape, which would be a great advantage at most of our military posts, as before explained.

If any "doubting Thomas" among the members of the shooting fraternity will construct such a target, and place it on a bright day by the side of the present regulation target, he will see the force of these remarks.

It may be claimed as an objection to the proposed target, that such good scores may not be obtained with it as with the one now in use. This objection would prove untenable, since *I have had this matter tested practically at the different ranges*, with the most encouraging results. I believe that better scores can be made with the black target than have heretofore been possible. Furthermore, the relief to the marksman's eyes would be of incalculable advantage.

At present most marksmen aim at the body of the target just below and a little to the left of the black bull's-eye; with the proposed target the front sight of the rifle could be outlined against the bull's-eye itself, which would simply cause a slight change in the elevation of the piece, and in the "windage" and "drift" allowed for.

In the second place, as some recumbent posture seems essential to good long-range shooting, I recommend, for reasons already stated, that the *prone position* be made the sole regulation recumbent position, and that the *back* and *side postures* be excluded. The evil effects upon the eye of faulty position have already been sufficiently discussed in the preceding pages, and it is now only necessary to refer to this fact.

I desire to say, in conclusion, that this paper is not intended as an attack upon rifle practice, but is written with a desire to obviate the evil effects, as far as the eye is concerned, likely to result from the performance of this military duty.

FORT LEAVENWORTH, KANSAS.

CONGENITAL STRICTURE OF THE ŒSOPHAGUS: WITH REPORT OF A CASE.

BY EMIL MAYER, M.D.,
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THE very rare occurrence of congenital stricture of the œsophagus, the duration before obtaining relief, and the fact of the patient having lived for nearly nine years on an entirely liquid diet, make this case of especial interest.

Edith Jackson S. was brought to the New York Eye and Ear Infirmary, March 5, 1892, to be treated for "some trouble when she swallowed." Her mother, who accompanied her, gave the following history: Edith was born on July 5th, nine years ago. As an infant she regurgitated very freely and to such an extent that preparations to receive rejected matter were always requisite. It was especially noticed that not only food was ejected, but also large quantities of ropy mucus.

This occurred during the nursing period of the first fourteen months of her existence, as also for some time after. After being weaned, attempts to feed her with pap and other semisolids were made, with the invariable result of regurgitation. The food thus given was taken with avidity, and some minutes thereafter she would masticate; there was absolutely no contraction of the abdominal muscles, as in vomiting, and the food would slowly be dropped out of the mouth. There was no sickness whatever during these regurgitations, and immediately afterward she would cry for more food, and take it, only to repeat the process. Her mother soon learned to keep her on liquid diet only; as the child grew older, bread, cake, meats, and other solids were given her, with the invariable result of regurgitation a few minutes afterward. Food has remained as long as ten minutes and then it began to return to the mouth until it was all ejected. Liquids have never been swallowed in large quantities at a time, the child sipping them very slowly from a teaspoon. For nine years the child lived on milk and beef-tea, getting ravenously hungry and yet unable to successfully swallow any solid whatever. At the age of three she nearly died of exhaustion, but nutritive enemata and concentrated foods tided her over. With the exception of an attack of pertussis and one of varicella in early childhood she has had no other illness. The family history is not of the best. Her father died of phthisis when she was seven years old, and two of her father's sisters died of the same disease. She has two younger sisters, both of whom are well.

Examination. Patient is very small and thin, and weighs thirty-five pounds. There is no color in her face; lips and conjunctivæ pale. Pulse 100, and not strong. In an attempt to swallow water she sips a little at a time. The child is apprehensive and rebellious.

The diagnosis made was stricture of the œsophagus. With the concurrence of Dr. Asch, who saw the case with me, the patient was directed to come again, prepared for examination under ether. On March 9, 1892, she was etherized in the operating-room, by the house surgeon, in the presence of Drs. M. J. Asch, Leonard, Weil, Van Fleet, and myself. When thoroughly anæsthetized, her head and shoulders were supported by an assistant, a mouth-gag was adjusted, and a warmed and lubricated bulbous bougie of a diameter of 6 millimetres was carefully introduced. A distinct grasping of the bulb was felt at the lower end of the œsophagus. A larger-sized bougie was now introduced and immediately removed. Patient rallied well after etherization.

On March 16th patient reported no ill effects from ether nor from introduction of the bougie.

An œsophageal bougie of full size, No. 18 of the English scale, measuring 9 millimetres, was thoroughly softened, warmed, and lubricated. The mouth-gag was applied, with the child held in its mother's lap, and the bougie carefully introduced into the stomach. The compression was felt at its lower end. The bougie was then withdrawn. The effect of this second introduction was wonderful. She was very thirsty after leaving the Infirmary, and drank, hastily and greedily, a pint of milk. She gulped it down. This was about fifteen minutes after the introduction of the bougie. An hour after she took three glasses of milk and ate an egg. The large-sized œsophageal bougies were introduced bi-weekly for four weeks, then weekly, then every fortnight, and then stopped altogether, on June 10th, three months after her admis-

sion. Immediately after the first introduction of bougies she began to eat solid foods, cakes, gruel, bread, meat, potatoes, fruit, etc., and there have been no regurgitations whatever since. An examination made of her on September 23, 1892, shows a healthy color in her face, and an increase in weight of eighteen pounds; weighs now fifty-three pounds; her appetite is good and she eats food in quantities; drinks freely and large quantities at a time. Whereas formerly she never left the house alone, she now goes out and acts as other children do. Body well nourished. Fluids held in the mouth enter the stomach in eight seconds.

A feature of this case worthy of passing notice was the attempts of the child to force the food down and make it remain. She lay on her back with her head far extended and would eat and try to swallow in that position.

Stricture of the œsophagus, as a result of swallowing lye and other acrid poisons, is very frequent. The literature of these is abundant: Campbell reports sixteen cases; and the records are full of cases due to carcinoma, inflammatory changes, and syphilis. Congenital cases are very rare. Ziemssen says: "Congenital atresiæ and partial defects in the œsophagus, since they are incompatible with long life, should not now call for further remark. But, on the other hand, there are stenoses of the œsophagus, although indeed *very rare*, which, from their anatomical structure (a perfectly healthy condition of the tissues and no trace of scars) as well as from their history (the existence of considerable difficulty in swallowing from the earliest childhood and throughout the whole life), must be considered to be congenital, but which, in spite of considerable narrowing of the tube, permit of a prolongation of life even till old age." He divides congenital strictures of the œsophagus into stenosis of the upper portion and of the lower.

Regarding stenosis of the upper portion he says: "There are only two well-authenticated cases of this kind to be found in the literature of this subject, to which we add a third. In all three the stenosis was located at the entrance of the œsophagus, in two it was a simple ring about the tube, in the third the canal was narrowed for a distance of 8 millimetres. In all three the patients declared that they had suffered from earliest childhood with difficulty in swallowing, which was especially troublesome when solid substances were swallowed. All three died at an advanced age, two by exhaustion from lack of nourishment, the difficulty having increased later in life, and the third died of cancer of the pylorus."

The cases quoted are:

(Everard Home.) Female, aged fifty-nine years; died from exhaustion. Post-mortem showed, immediately behind the first ring of the trachea, a uniform circular contraction formed by the mucous membrane, which presented a perfectly normal and healthy appearance.

(Casan.) Male, aged seventy-seven years; died of exhaustion. Pharynx at lower half was found increased to double its width, and filled with a whitish

pap. Below this was a sudden narrowing in the form of a circular ring, with a puckered edge and a diameter of one millimetre. This led to an equally narrow canal eight millimetres long, in which the mucous membrane lay in longitudinal folds, and which terminated in a funnel-shaped enlargement below. There was not the least change in the mucous membrane at the seat of the narrowing.

(Zenker.) Female, aged sixty-six years, died of cancer of the pylorus. The œsophagus was greatly contracted in its upper portion in a circular form; the mucous membrane was pale, delicate, and unchanged in anatomical character.

Strictures of the lower portion of the œsophagus congenital in origin have been described by Blasius, Cruveilhier, Hilton-Fagge, and Wilks.

In all these cases the stricture affected a small region in the lower part of the tube, and immediately above it the canal had suffered saccular dilatation, in which Cruveilhier found large polypoid vegetations of the mucous membrane, and in Fagge's case an epithelial cancer had perforated the wall.

In Fagge's case, the patient, aged forty-eight years, had difficulty in swallowing for forty years; had to divide food finely. Never regurgitated.

In Wilks' case, the patient died seventy-four years old, of pneumonia. Had difficulty in swallowing and regurgitated food. Had to use quantities of fluid. The stenosed portion would scarcely admit the little finger, while the œsophagus above was enormously distended and hypertrophied.

Koenig says: "As far as congenital strictures are concerned, there is no satisfactory evidence of their existence in the bodies of children. Zenker and Ziemssen have reported three cases, and Blasius and Cruveilhier each one." These do not seem to him to be fully proven to be congenital in origin. He quotes Wernher, who says: "Congenital strictures of a degree sufficient to interfere with deglutition are much more rare than complete occlusions. They are found with a blind pouch or crop-like dilatations of different parts of the œsophagus, occurring oftenest in the upper part." While Koenig is unable to find any literature to support the claims that these contractions and diverticuli are congenital, still he believes that they may occur.

Turner narrates a case of a child, eighteen months old, with symptoms of œsophageal obstruction, who died in a fortnight from inanition and exhaustion. The symptoms whereon the diagnosis was based were, that the child drank ravenously, and after an interval of a half-minute the mouth would be opened in a spasmodic manner, and the greater part of the fluid regurgitated in successive gushes, without retching or exertion except contraction of the abdominal muscles.

Autopsy. Œsophagus at its lower part much dilated, and its muscular coat hypertrophied. Tight stricture at cardiac orifice; a No. 2 catheter passed with difficulty. No appearance of cicatrization.

Crary reports a case, a male aged twenty-five years, admitted to Roosevelt Hospital in September, 1889. Had difficulty in swallowing since birth. Regurgitated as an infant. At the age of twelve he had frequent aggravations of the trouble; could not at such times swallow water, and would have to go to bed until the stricture relaxed. While in France a bougie was passed, but no opinion was expressed. Had recurring attacks, at intervals, of complete stenosis. Food had to be very minutely divided, and often it became neces-

sary for him to leave the table in order to relieve himself of some of the food which he had taken.

Examination revealed malnutrition, and the patient very weak. Stricture suspected, and a No. 20 (French) bougie was passed through the œsophagus into the stomach. The stricture was long, from fourteen to sixteen inches from the teeth, diminishing in calibre as it approached the orifice of the stomach, near which opening it was evidently located.

Bougies were passed tri-weekly for two months, and then passed easily, admitting later an instrument of eight millimetres.

Patient gained in health and strength. There has been no regurgitation since the first bougie was introduced, and with some restrictions he lived comfortably. No specific nor tubercular history. The trouble was probably due to an arrest of development by which the formation of a free communication between the œsophagus and stomach was prevented.

Gerhardt says: "Congenital strictures of the œsophagus are very rare," and mentions those reported in Ziemssen and that of Turner. Ziegler speaks only of those strictures caused by cancer or cicatricial tissue.

Mackenzie says: "Although it is highly probable that the condition is a congenital abnormality, I am not aware that there is any instance on record in which its existence in early life has been proved by post-mortem examination." The diagnosis is not always easy. Hamburger goes extensively into the question of auscultation of the œsophagus, and Mackenzie and Elsberg have also written on that subject. With care, obscure cases can be readily detected by this method.

As to the treatment, dilatation with bougies ranks first. It is necessary to remember, however, that the introduction of bougies must be carefully done, the largest possible size being used to begin with.

A. Jacobi reports a case of stricture of the œsophagus due to swallowing lye, in a child of seventeen months, where attempts had been made to pass œsophageal bougies. There resulted a fistulous tract, commencing in a hole in the mucous membrane and submucous tissue, running along the outer and posterior aspect of the œsophagus to near the neighborhood of the diaphragm, and there perforations had taken place into the right pleural cavity. In the latter place, milk and whiskey were found.

From the foregoing it will be seen how very unusual these congenital strictures are. It is fair to assume that the correctness of the statements of the patients who died as old people, that their trouble dated from infancy, and hence was congenital, may very readily be doubted, although the strictures showed no cicatricial tissue.

Koening and Mackenzie have, therefore, expressed their doubts.

The cases reported by Turner and Crary, as also the one here reported, demonstrate the fact that congenital stricture of the œsophagus is a condition that may and does exist, and that under careful treatment recovery is possible.

The obstruction in this case was, in all probability, due to a membranous band almost occluding the œsophagus in its lower portion.

NOTE.—The patient has been under observation for one year since the last report of her condition. There has been no return of the re-

gurgitations and she continues to swallow all foods. Has now become a strong and healthy girl, there being a marked contrast to her former appearance. The œsophageal tube, which has been introduced once in every six or eight weeks, is no longer grasped as it readily enters the stomach.

A CASE OF POISONING BY A BELLADONNA PLASTER.

By Ernest E. Maddox, M.D. Edin.,
formerly syme surgical fellow edinburgh university.

Miss P., aged about thirty years, a music teacher, was sent me by her physician on account of obscure eye symptoms.

Her complaint was that on rising one morning she found a mist over her vision, and found that she could not read unless she held the book at a good distance. This was on a Monday, but during the week the symptoms were ameliorated by taking a dose of Gregory's mixture. On Sunday, however, they began to return, and by Monday were as bad as ever. On Tuesday she came to consult me. She looked flushed, and her eyes had an unnatural brightness, the pupils were not larger than they often are in those who, like herself, have slight myopia.

What aroused my suspicion was that she was always moving her mouth about in want of saliva, and on inquiry she said that her mouth and throat were painfully dry. Her near point of vision was found to be not nearer than a half-metre, so that, as she had 0.75 D. of myopia, her range of accommodation was only 1.25 D., instead of being, as it should be at her age, 7 D.

Feeling sure that belladonna must be accountable for the symptoms, a searching inquiry was made as to the possibility of her having had it in some prescription or liniment, but all such possibility was denied.

At last she volunteered the confession that she wore a plaster over the lower part of the back, unknown to her physician, and that it was possible this might contain belladonna. Inquiry into her other bodily symptoms placed it so beyond doubt that the suspicion would prove correct that she was simply ordered to remove the plaster and take a purge. This she did, with the result that the symptoms rapidly disappeared, though even eighteen days afterward, when she called again, the near-point had not been quite recovered, and some of the nervous symptoms had not completely disappeared.

The symptoms, which I carefully noted when she first came, were so well marked, and many of them so characteristic, that they are worth recording as a study of the physiological action of belladonna. The dryness of the mouth and throat has already been alluded to; besides this her eyes felt dry, and her skin also. Her pulse was 106, and the apex-beat of the heart very strong and diffused. This is well known to be due to paralysis of the cardio-inhibitory terminations of the vagus. On inquiring about her flushed face, she said she was naturally rather pale, adding: "I never have such a color as I have just now?" Her face felt hot. The eyes appeared smaller (was this due to paralysis of the unstriped muscular fibres of Müller?) and had a piercing look; to relieve their unpleasant dryness she had been obliged to bathe them with milk and water. She says her eyes seemed to have retreated more

into their sockets; this is quite possible, for it is well known that belladonna often relieves exophthalmic goitre, and it may do so by paralyzing the unstriped muscle behind the globe. It is not well, however, to attach too much importance to the observation of a patient on this point, for the mere dilatation of the pupil may deceive him, and make him think the eye looks smaller or more deeply sunk. She had well-marked accommodative micropsia, and complained spontaneously of it, saying, "A sixpence looks like a threepenny piece." Her color sensations had an abnormal permanency, so that if she looked at anything red or blue, the next object she looked at appeared to be of the same color. This is an interesting phenomenon because it is sometimes met with in individuals otherwise normal. I have met with one very well-marked case of such abnormal persistency of color sensation. It appears to be one form of hyperæsthesia of the retina, unless, indeed, its seat be in the nervous centres. Closely allied to this are the mental hallucinations so characteristic of belladonna. One night she called her sister's attention to a light shining in at the window, but her sister could see nothing. At other times she thought she saw dark objects. There was hyperæsthesia also of the other senses, so that any disagreeable odor appeared far worse than usual, and noises were unbearable. This keenness of sensation perhaps accounted for the fact that she could not sleep well, but kept waking up every hour. Her natural "nervousness" had been greatly increased by the belladonna; she had become "dull and desponding," life seeming miserable to her during the night; there was also loss of self-confidence, and a feeling as if it were not safe to venture out into the streets alone; she became taciturn, and yet irritable with her pupils; could not remember the day of the week, thinking, for instance, on Wednesday that the day before was Sunday. She would cross the street rather than meet with her friends, from a sense of timidity. Her locomotor equilibration seemed affected, for on rising in the morning she felt giddy and disconcerted on putting her feet on the floor—feet and limbs not seeming to move as they used to; "less agility in movement," and, on walking, felt as if her foot needed putting down a second time. These symptoms are interesting as being distantly related to some of those in locomotor ataxia, being, however, functional instead of organic.

The bladder symptoms were almost pathognomonic of belladonna poisoning, and are of interest in connection with the undoubted service of this drug in the enuresis of children. She had frequent desire for micturition, having to rise three or four times at night and passing much more than usual, very pale, and occupying a long time in its evacuation by a thin stream, with complete intermissions as though micturition were over, then beginning again. This probably points to the muscular fibre of the "detrusor urinæ" being semi-paralyzed. The copious flow of pale urine, reminding us of hysteria and of those nervous headaches which are associated with the same hyperæsthesia of the senses, is no doubt nervous in its origin, unless, indeed, it be, as Dr. Haig would have us suppose, a question of the action of belladonna on the vital chemistry of uric acid.

In conclusion, it may be said that the plaster was found to be made by one of those firms who pride themselves on the excellency of their belladonna plasters, and who exhibit the results of tests to show how

much more belladonna they contain than the officinal plasters. The case recorded shows there is a limit to excellency of this kind, and that there is need for caution not to carry it too far.

THE OCCURRENCE OF HEMORRHAGE AFTER OPERATION FOR THE REMOVAL OF ADENOID TISSUE FROM THE NASO-PHARYNGEAL VAULT: WITH THE REPORT OF A FATAL CASE.

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Of all the operative procedures done in our work, no one is probably more frequently undertaken than that for the removal of adenoid tissue from the naso-pharyngeal vault. It is performed so often that we are apt to look upon it as a minor affair in execution, however much we may laud its therapeutic value. An unfortunate experience occurring in my own work some time ago, and that, too, under somewhat unusual circumstances, is my excuse for again bringing this matter forward.

The possible complications after this operation may be grouped as follows:

1. A bronchitis may arise from the escape of blood into the lower air-tract.
2. An infectious element may be introduced, leading to septic mischief.
3. Inflammation of the middle ear may result.
4. There may be hemorrhage, primary or secondary.

The first of these may be dismissed as very unlikely to occur if proper precautions are taken. The blood quickly clots, and not coming from an arterial source is devoid of any propulsive force. What seems to go down the throat glides down into the œsophagus and stomach. The coughing is from the reflex irritation of the lower pharynx and does not signify a filling of the air-tubes. In one case (Delavan), a clot fell on the larynx and obstructed the glottis, but it was expelled without doing any damage.

Another case will doubtless be recalled to mind—that also reported by Hooper, where a digital examination in a hæmophilic subject caused a fatal hemorrhage.

Relative to the second heading, two cases of traumatic fever have been reported by Moldenhauer, one case of facial erysipelas by C. Michel, and one by Wendt; also a case of mild angina with cervical adenitis by Cartaz. Cases of middle-ear trouble are not rare, though in my own work, running back about five years, I have met with only one such.

This was a mild case and subsided without suppuration. In no instance, previous to the present one, have I ever seen an amount of bleeding sufficient to cause the slightest anxiety.

The history of the case forming the basis of this paper is as follows:

A boy, aged three years and nine months, of Irish parentage, was first seen by me in March, 1892. He was anæmic and of a somewhat general strumous appearance. He had a bronchial catarrh of the larger tubes which had lasted for several weeks. Simple measures relieved the latter, but the anæmia continued, in spite of tonic treatment carried on for some time. Inquiry into the condition of his various bodily functions pointed unmistakably to the existence of adenoid vegetations in the naso-pharynx. This suspicion was confirmed by a digital exploration. Removal of the tissue was advised and agreed to by the mother. An appointment for the operation was made for April 26, 1892, at the Roosevelt Out-patient (Throat) Department—in the service of Dr. Jonathan Wright.

The family history of the patient was negative. Not the slightest evidence of hæmophilia could be obtained on the side of either parent. The child had no unusual nose or throat lesions. He lived in a tenement and presented the usual characteristics of the class. He was of normal size and weight.

The rules governing these operations which are in force at the Roosevelt Hospital are as follows: The hour chosen is 2 P.M. The mother is cautioned to give the child a fluid or semifluid breakfast and nothing but water for at least four hours before the anæsthetic is given. A dental chair is generally used with its back depressed so that the patient lies supine, with the shoulders slightly elevated. The anæsthetic used is ether, carried only to the primary degree. The instruments employed are the O'Dwyer gag, the various modifications of the Löwenberg and Gradle forceps, and Gottstein's curette, as may be best suited to each individual case. No subsequent topical treatment is employed. After the operation the patient is rolled on the side and the head allowed to fall back over the edge of the chair, being supported in that position by the hand. A close watch is kept till bleeding ceases and consciousness is fully restored. The patient is allowed to lie quietly for an hour or more under the supervision of the mother, who is then instructed to carry it home, keep it quiet in bed for twenty-four hours, and on a light diet. Unless she lives within calling distance of some one of the clinical staff, who may be summoned in case of an emergency, it is insisted that the patient be left in the children's ward of the hospital over night. Unwillingness to comply with this condition is met with a refusal to operate.

In accordance with these rules the operation was done on the date given above, the case having been assigned to me by Dr. Wright. Ether was skilfully administered by Dr. Sherman, of the clinical staff, and taken very kindly by the patient. A Gradle forceps with scissors handle (Nichols' modification), and a Gottstein's curette were employed. A fair amount of tissue was removed. The bleeding was rather free for a minute or two, but quickly ceased. Restoration to consciousness was speedy. On leaving the hospital, two hours after the operation (4 P.M.), the child was bright and apparently doing well in every way. The mother was instructed to send for me if necessary, as I happened to live nearer than any other member of the staff.

The history of the next fourteen hours was obtained from her. At six o'clock (four hours after the operation) the child began to have a "rattling" in its throat (mother's statement), and slight bleeding from the anterior nares. The latter soon ceased, but the "rattling" continued with increasing severity. The mother decided to send for me, but was, in some unaccountable way, dissuaded by her neighbors from so doing. They told her that "the child was all right," "was in no danger," "children always acted that way after operations," etc., and so lulled her into a false sense of security. Meanwhile the oozing hemorrhage went steadily, though slowly on. At six the next morning (sixteen hours after the operation) I was sent for, as it was evident to all in attendance that matters were becoming desperate. I reached the house at 6.30. The picture upon entering the room was that of an exsanguinated child lying on a pillow in an arm-chair. It was perfectly conscious and swallowed some brandy and water without the slightest difficulty. The skin was cold and slightly moist. The breathing was rapid and shallow, with loud tracheal râles. The heart action was frequent and feeble. Percussion detected dulness all over the chest posteriorly, most pronounced over the lower lobes. By palpation it was very evident that bronchial fremitus was much more pronounced behind than in front. Nothing had been given in the way of medicine. The child had simply been left to bleed.

The administration of brandy and water was continued with, for a moment or two, apparently promising results, and the child wrapped in warm blankets. In order to work with greater ease, it was lifted, still in the recumbent position, to the sofa. Scarcely was this done, however, when it gave a slight gasp, a general muscular shudder, and stopped breathing, and in a minute or more heart action also ceased.

It is useless to speculate as to whether the bleeding could or could not have been checked had medical aid been earlier summoned. Judging from the experience of others, it is not illogical to reply in the affirmative. Proper tamponing would probably have averted the unfortunate result. There was in my own mind no doubt as to the cause of death. The picture was a typical one of exhaustion from a slowly progressing hemorrhage. Every precaution was taken to provide for emergencies, and no fault of management, it is honestly claimed, could attach to the operator.

The error, if one existed, was an error of judgment as to the advisability of operation. Did the child's previous general condition contraindicate operative interference? Delavan, in a paper read before the last meeting of the American Laryngological Association,[1] discusses the influence of certain diathetic conditions upon the prognosis in operations upon the throat, especially the hemorrhagic, rheumatic, and strumous, as well also of exophthalmic goitre and general lymphadenoma. All of these could be excluded in this case, except, perhaps, the strumous. Though there were no pronounced manifestations of the latter, yet we all

[1] See Transactions American Laryngological Association for 1892, and New York Medical Journal, November 19, 1892.

recognize the possible existence of minor grades of this factor in all tenement children. The therapeutic needs, suggested by the child's condition, were carefully noted, and improvement resulted up to a certain point. The amount of adenoid tissue existing was, in the operator's opinion, sufficient to account for the stationary condition by reason of imperfect oxidation of the blood, and consequent lowered vitality. Its removal was therefore indicated.

What are the general causes of hemorrhage in the non-hæmophilic and non-diathetic cases? Cartaz (*Revue de Laryngol.*, 1890, No. 13) enumerates them as follows:

1. Hemorrhage has occurred more frequently where no anæsthetic has been used.

2. We may directly injure a large bloodvessel.

3. We may tear off a piece of healthy pharyngeal mucous membrane. Where no anæsthetic is used, the reflex palatal movements are not restrained. Palatal contractions so narrow the palato-pharyngeal space that a bit of mucous membrane is seized. The advocates of the curette claim that this does not ever happen with this instrument.

4. Hemorrhage is apt to occur in females past the menopause, if the operation is coincident with the menstrual epoch (a point with reference to which we do not often, I fancy, make inquiry).

5. Hemorrhage may occur if there has been a recent inflammation of the back part of the throat.

6. It may occur if the masses to be removed have a fibroid consistency.

As one looks over the various text-books, the subject of hemorrhage after the operation is very briefly alluded to. The general impression seems to be that its occurrence is very unlikely. Yet, if the truth were fully known, it would probably be found that cases requiring tamponing are, among the older patients at least, by no means rare. Morell Mackenzie is on record as never having seen a case in which bleeding could not be checked by the insufflation of tannin or matico powder. Max Schaeffer (*Berlin klin. Woch.*, July 15, 1891) has operated one thousand times without any severe hemorrhage. In the discussion following the latter's paper, Lange, of Copenhagen, reported seven hundred cases, with only one severe hemorrhage. Another participant in the discussion had had two cases, number of operations not given. Löwenberg[1] has always found alum sufficient to check any bleeding he has met with. There are so many loose statements on this point that it is difficult to get at the exact facts.

Authentic cases of hemorrhage have been reported by Delavan[2] and Cartaz,[3] and, as this paper was in preparation, by Rousseau,[4] of Brussels.

[1] Les Tumeurs adenoïdes de Naso-Phar., Paris, 1879.
[2] New York Medical Journal, Oct. 12, 1889.
[3] Loc. cit.
[4] Revue Internat. de Rhinologie, May, 1892.

In a recent paper read before the French Congress of Laryngology, he enumerated sixteen cases from various sources. None of the cases proved fatal. An effort to tabulate them is difficult, because the data are in many instances wanting.

Making the best analysis possible, it is seen that out of eleven cases in which the age is given, four occurred in the first decade of life and five in the second. The youngest age recorded is four years (Delavan), while the oldest is twenty-eight (Ruault). In one instance (Capart) it is stated that the patient was an adult. The use of an anæsthetic is recorded only three times, chloroform once, ether once, and cocaine 5 per cent. once. The list of instruments as given includes the curette, finger, and various cutting forceps. The time after operation at which bleeding commenced varied from immediately to twenty hours. Tamponing seemed to be the favorite measure of relief employed, though in one case (Ruault) it could not be borne, and hemorrhage ceased upon the supervention of syncope. In another case (Cartaz) the occurrence of uterine colic, coincident with the accident in the naso-pharynx, suggested the onset of the menstrual epoch, and revulsive measures established the uterine flow, coincidently checking the hemorrhage in the throat. The accident in this case occurred only after the third operation for the removal of the offending tissue. In one case (Segond) bleeding stopped of its own accord, but returned on the eighth day. In several it was so severe as to cause syncope. In the paper by Delavan (see above) there is a record of a fatal case in a child aged four, and a third fatal case recorded, occurring in his own practice. The latter patient was a boy aged two and a half years. The operation was done under ether with Löwenberg's forceps and the finger-nail. Hemorrhage occurred eight hours later and death in about twenty-four hours.

It is hardly probable that the mere size alone of the mass removed is a factor in bleeding.

Wright has reported the case of a young woman operated on under the most favorable circumstances in whom post-nasal tamponing with cotton dipped in iron nitrate solution was necessary, yet he had previously removed from the same patient larger pieces of tissue without any hemorrhage whatever. The explanation of this, and similar cases, may lie in the fact that the deeper we go from the surface of the lymphoid mass the more vascular the parts naturally become. Our first cut, embracing the more superficial portions, causes slight bleeding only. The deeper ones are more apt to bleed. The limitation to this view would be the fibroid consistency of the growth, as with the soft material we would endeavor to remove it all with one application of the cutting edge.

It is natural to ask if the position of the patient during operation is a factor in causing the danger we are discussing.

Lockhart Gibson prefers a steel finger-nail in operating, of such a shape that it is curved over so as to bring the plane of the cutting-edge parallel to the top of the pharyngeal vault. He regards bleeding as occurring so frequently that it is hardly safe to operate with the patient in the usual position for chloroform administration. He advocates what he calls Rose's position, which we more commonly know as Howard's. The patient lies supine with his head hanging so far backward over the edge of the table that the line of the face is almost vertical. The head is supported in that position either by the hand or by a projecting shelf. He uses a rhinoscopic mirror, an assistant pulling forward the palate. The blood comes through the dependent nostrils, and a good opportunity is allowed for subsequent irrigation before recovery from the anæsthetic.

It has been pointed out by several observers how too long a continuance in this position might interfere with respiration and by obstructing the cervical veins cause a venous congestion which would predispose to the very accident it was intended to prevent. It seems to the writer that it is safer to operate in the usual position for general anæsthesia (excluding those cases of course were cocaine is used). After the operation is concluded there is a brief space of time before the return of consciousness, during which the head can be placed so as to let the blood flow through the nostrils and allow of subsequent irrigation if the latter is desired. One point in technique seems to be worthy of note. Wroblewski[1] cleanses the cavity with a piece of iodoform gauze placed over the finger-tip. He wipes the vault out with gentle force, regarding a smooth surface as a condition greatly to be desired. No tags of tissue ought to be left.

Moreover, it is not the writer's opinion that the nature of the instruments used enters into the question of bleeding, granting that all are used with equal skill. Hemorrhage has followed the use of the bare finger, the steel nail, various forceps, and the curette. Undoubtedly some instruments are, in unskilful hands, more liable to do damage than others.

One single case proves very little either way. Yet such an experience as the one narrated proves that we cannot be too careful in our simplest procedures. Patients from whom adenoid tissue is removed ought to be kept under careful observation for at least twenty-four hours. No single instrument is the ideal one for every case. Unless one single application of the curette will suffice to clean out the pharyngeal vault the writer inclines to the use of an anæsthetic. He prefers ether carried to the primary degree, and the forceps, either the Gradle instrument or a modification thereof, and supplemented frequently by the use of the curette and finger-nail.

[1] Revue de Laryngol., 1892, No. 9.

COMPLETE PROLAPSE OF THE RECTUM; AMPUTATION.

By Walter Edmunds, M.A., M.C., M.D. Cantab., F.R.C.S. Eng.,
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The patient was a single woman, aged twenty-five years. She had suffered for many years from a prolapse of the rectum, for which no treatment had been of any avail.

It was decided to perform the operation of removing elliptical portions of the mucous membrane, and thus narrowing the orifice. After the operation, as long as the patient remained recumbent, the bowel retained its position, but on her getting about, the prolapse recurred and became as bad as before.

Three months after this operation a second attempt was made. It consisted in excising on each side a considerable portion of the distended external sphincter and bringing the free edges together. But, as before, when the patient began to get up again, the prolapse recurred.

Encouraged by the perusal of a successful case of excision of a prolapse of the rectum by Treves,[1] I decided to advise the patient to submit to a third operation, to which she consented.

Under an anæsthetic, the patient was placed in the lithotomy position, with the pelvis well raised, to avoid, if possible, any prolapse of small intestine into the peritoneal pouch, which it was expected to encounter.

The prolapsed rectum having been drawn well down, a transverse incision was made in front of the prolapse at the junction of skin and mucous membrane. On deepening this incision a pouch of the peritoneum was opened, and the extreme lateral boundary of this to the patient's left (and operator's right) was sought. Both the parietal and the visceral layer of the peritoneum (on the rectum) were divided in stages from left to right, the two layers sewn together, and in this way the abdominal cavity was shut off. Nothing was seen of the small intestine.

The amputation of the prolapsed rectum, flush with the surface, was then completed; bleeding-points were secured and the mucous membrane was sewn to the skin all around. The amputated portion contained the greatly dilated sphincter and eight square inches of peritoneum, a prolongation of Douglas's pouch.

The patient made a satisfactory recovery. She was last seen fourteen months after the operation. She was then quite well and could walk several miles. There was no prolapse, no incontinence of feces, and no contraction of the orifice. The line of junction of the skin and mucous membrane had retreated somewhat upward, and at that level a band could be felt, suggestive of an internal sphincter, but it probably consisted only of connective tissue.

Cases of prolapse of the rectum treated by amputation will be found recorded by Partridge in the *Indian Annals of Medical Science*, 1871, No. 27; by Raye (at Calcutta), in the *Lancet*, July, 1886, and by Treves, in the *Lancet*, February, 1890.

[1] Lancet, February, 1890.

REVIEWS.

PHYSICAL DIAGNOSIS. A GUIDE TO METHODS OF CLINICAL INVESTIGATION. By G. A. GIBSON, M.D., D.Sc., F.R.C.P.Ed., and WILLIAM RUSSELL, M.D., F.R.C.P.Ed., both Assistant Physicians to the Royal Infirmary and Lecturers in the Edinburgh Medical School. Second edition, revised and enlarged. With one hundred and nine illustrations. Pp. 383. Edinburgh and London: Young J. Pentland, 1893.

A WORK of this size which attempts to include so much is always open to criticism, in that no two would agree as to what should properly be omitted. What the writer deemed important enough to merit attention may seem to another as of too little moment to deserve consideration, and the omission which to the writer was a virtue may be magnified into an unpardonable sin when viewed through the lens of the critical reviewer. The faults with this work seem more faults of judgment than in statement of facts.

Brief introductory chapters on Methods and Terms, and Temperature open the book. We judge that the use of the binaural stethoscope is not advised. In the chapter on Temperature, "febricula," ushered in by slight rigor and rise in temperature of several degrees, is spoken of as frequently occurring in women a few days after delivery. In the accompanying chart the temperature is represented on the third and fourth days after delivery as between 103° and 104°, dropping two days later to normal. We confess that with us a "febricula" of this character in the lying-in woman is always a cause of more anxiety than it seems to be to our authors. With the treatment of the puerperal woman now in vogue, such rises in temperature should not be so common that it may be said they "frequently occur," and when they do, sepsis of some form is to be suspected.

A superficiality in treatment of some of the topics, an inevitable result of the attempt to put so much in so small a space, is noticeable, more, perhaps, in the chapter on the Integumentary System than elsewhere. It would have been wise to have utilized the twenty-six pages devoted to the skin, in considering skin lesions merely in the light of indices of disease, rather than to attempt to cover in so few words the diagnosis of the many diseases peculiar to dermatology. The help gained by the student in perusing these pages will, we fear, be very slight. Confusion will more than likely result. The mere mention of the category of skin diseases, with a brief word as to each, does not add to the value of the book. No student could, with the aid derived from this chapter, make a positive diagnosis of a single disease of the skin.

In the chapter on the Circulatory System the authors seem more at home. There is less indefinite generalization here, and the chapter, as a whole, is excellent. We would note as worthy of special commenda-

tion the figures illustrating, diagrammatically, the variations in the heart sounds, the time and mechanism of endocardial murmurs and the area of the chest wall over which each murmur is best heard. There is nothing in the whole subject of physical diagnosis simpler than the rudiments of cardiac ausculation, at least theoretically—and yet there is nothing more difficult for the student to grasp than these fundamental facts concerning normal and abnormal heart sounds. The figures here employed, many of them original, will certainly do much to prevent confusion in the mind of the student and give him an early, clear conception of this important subject. The pulse, too, is fully treated of, including the use of the sphygmograph. While considerable space is devoted to this instrument, and numerous pulse-tracings are portrayed, there is no false impression left as to its value. "It must be borne in mind that the sphygmograph is of limited use in diagnosis" (p. 98). The five pages devoted to the examination of the blood contain very brief and somewhat incomplete directions for the use of Gowers' hæmocytometer, the Thoma-Zeiss instrument, and Gowers' hæmoglobinometer, and that is about all. No mention is made of Fleischl's hæmometer, of any method of determining the specific gravity of the blood or of examining stained preparations after Ehrlich's method. The subject of the blood is not treated in a very satisfactory manner. It is better to omit entirely the consideration of such a subject than to give a mere smattering knowledge of it.

The chapter on the Respiratory System is in most respects praiseworthy. There is shown here intimate practical acquaintance with pulmonary diseases, and also an experience in teaching students concerning these diseases. The explanations of physical signs are clearly given, the acoustic principle involved and the pathological anatomy of the condition in question being plainly set forth, so that the reason *why* a certain sign is present is brought prominently forward. The diagrams here, as in the case of the circulatory system, are of genuine value to the student. The force of the plea for uniformity of nomenclature will be appreciated by teachers, though the undergraduate may not realize its full import until his reading has become more extensive. The need of some common system of nomenclature in diseases of the chest is evident when we compare our authors' terms with those of Flint, for instance. Flint's adventitious sounds are spoken of as "accompaniments," and of these there are four varieties: (1) rhonchi, sibilant or sonorous; (2) crepitations, "sounds which resemble those produced when salt is thrown into the fire." "They are produced in the bronchi, in the alveoli, and in pulmonary cavities." (3) friction; (4) additional sounds, metallic tinkling, the bell sound, and the succussion sound. The sounds heard and described by Flint and our authors are the same. But the adoption of a different system of classification, and the employment of different terms, make more or less confusion for the reader, and especially for the student who lacks practical experience. We fully agree with what is said as to the great value of the *sense of resistance* upon percussion. Impossible accurately to describe, and only of worth after much practice, it finally becomes to the diagnostician one of his most trustworthy aids. Attention is rightly called to the fact that pleurisy is often primarily diaphragmatic and beyond the reach of auscultation. The importance of familiarizing oneself with the normal sounds over the extreme bases of the lungs, in order that slight amounts of fluids may be here detected, is

urgently insisted upon. Few works, this included, lay the stress they should upon exploratory puncture as a safe, scientific, and, in cases, indispensable method of physical diagnosis. Many a doubtful diagnosis would be cleared up and many a wrong one set right, were the aspirating needle more often used for diagnostic purposes. Brief directions for staining tubercle bacilli are given, but it is assumed that the student knows the formulæ of Heneage Gibbes' and the Ziehl-Neelsen's stains. If the student knows these formulæ he probably knows the method of staining and will not find it necessary to consult this book.

The chapter on the Alimentary System, while containing many excellences, is unsatisfactory, because unfinished in details. The methods of diagnosing a dilated stomach are very imperfectly given. To teach that "evidence of dilatation of the stomach is obtained by producing a splashing sound in it" (p. 197), is to teach what is but partially true. Many patients with normal stomachs can, at times, voluntarily produce a succussion sound. To speak of the examination of stomach contents and omit even to mention Ewald's test-breakfast is certainly unpardonable. The few words concerning inflammations of the cæcum and appendix are scarcely in touch with the later ideas concerning appendicitis and its consequences.

The chapter on the Urine contains quite detailed descriptions of the methods of urinary examinations. The figures illustrating the text are good. We are pleased to see the simple and valuable ureometer of Doremus and Thursfield described by text and figure. It would seem as though our authors have shown a little unjust discrimination against tube-casts when they allotted them only sixteen lines of text and gave to urea, uric acid and urates sixteen pages. Certainly a more fair distribution of space might have been made.

So, too, in the chapter on the Nervous System we find the same disproportionate assignment of space. Out of fifty-five pages devoted to the nervous system, twenty-four, nearly one-half the entire number, are taken up with the consideration of the eye, errors of refraction, etc. Important as these facts in ophthalmology may be to the general practitioner, and valuable as the examination of the eye is to a complete diagnosis of many diseases of the nervous system, too much space is taken up, at least comparatively, with matter worthless to the oculist and of less value to the general practitioner or neurologist than other matters omitted. And this is doubly true when we turn a few pages farther and find much already said concerning the eye practically repeated in the chapter—Examination of the Eye, Ear, Larynx, and Naso-pharynx.

In conclusion we may say that while the book abounds in evidence of the diagnostic acumen of the authors, and of their practical experience as teachers, while it contains many admirable hints here and there as to some little detail of diagnosis valuable alike to student and practitioner, it is, as a whole, faulty in that while attempting to crowd much into a small compass our authors lack terseness and perspicuity; too often where detailed description is demanded they generalize, and *vice versa;* there is a very unfair assignment of space and marked inequality in the treatment of topics.

With liberal excision and addition the book could be made of value.

J. B. H.

BRAIN SURGERY. By M. ALLEN STARR, M.D., Ph.D. 8vo., pp. xii., 295. New York: Wm. Wood & Co., 1893.

PERHAPS no book published of late shows more the overlapping of the different departments of medicine than the present volume, even by its title. *Brain Surgery* is not written by a surgeon, but by a neurologist. In spite of the fact, however, that the book is a capital one and the subject well treated, yet we must confess we regret that a surgeon was not associated with Dr. Starr in its production, as in that case some of the surgical portions would have been more completely treated and a number of small errors avoided. For instance, the whole topic of thrombosis of the lateral sinus and other lesions following middle-ear disease (with the exception of abscess) is dismissed in five lines, of which two consist of a reference to Ballance's well-known article. Surely any work on brain surgery at the present day which omits the consideration of this important topic is in so far imperfect. So, too, the whole consideration of headache and meningitis, which covers less than a page, would have been more elaborated. And a surgeon would scarcely have suggested (page 18) that the fissure of Rolando should be "marked upon the skull by the sharp point of a scalpel, so that, when the bone is laid bare, surface landmarks will still be kept in view," for the sharp point of the scalpel would simply be broken, and the skull would not be marked. Either an awl or a gouge, as suggested on page 278, or the centre-pin of a trephine, is the proper instrument for such a purpose.

We are glad to see that the author has made this essentially an American book. There are few things more noticeable within the last few years than the tendency in this country to write text-books, monographs, and treatises distinctively American in their origin, with knowledge and experience drawn largely from this side of the Atlantic rather than from the other. This is a natural result of our larger, wider experience, of the constantly enlarging numbers of scientific writers, and of the growth in this country of a class of teachers who, like Dr. Starr, can speak *ex cathedra*.

The book consists of ten chapters, in which are first considered the diagnosis of cerebral disease, and then trephining for various conditions, such as epilepsy, imbecility due to microcephalus, cerebral hemorrhage, abscess, tumor, hydrocephalus, insanity, and headache, and terminates with a distinctly surgical chapter on Technique. The chapter on Diagnosis is an excellent *résumé* of the whole topic, is up to date, and will be found very interesting reading by the general practitioner.

That on Epilepsy is the most elaborate, covering about one-third of the entire book. We are inclined to think that the author is a little too sanguine as to the success of the surgical treatment of epilepsy. Of the 13 personal cases reported, Dr. Starr classes 3 as cured, 5 improved, 4 not improved, and 1 death. In reviewing the cases, however, it is clear that two died, and we do not think that any one of the eleven who recovered can be classed strictly as "cured." Most of them were done in 1892, and the latest report on the cases is in March, 1893, too short a time to judge of the final result. That cases of epilepsy are cured by trephining there is no question, especially cases resulting from

traumatism; but there are not a very large number of them. A much larger number have been greatly improved, and in this frequent improvement and occasional cure is found the justification of their surgical treatment. Until we can show a number of cases cured for at least three years, we do not think that a definite conclusion can be drawn in this matter.

In considering the question of trephining for imbecility due to microcephalus, porencephalus, and allied conditions, Dr. Starr is wisely conservative, stating that undoubtedly there are a few cases in which markedly good results follow, but in the majority of cases not much can be hoped for, though these cases are so deplorable that any improvement, even at a greater risk than trephining presents, would be welcome. The author makes the suggestion in this chapter (page 135) that, before opening the dura, the surgeon, by manipulation or by a hypodermatic needle, should ascertain if possible whether the brain is porencephalic or not, and if so, that he should avoid opening the dura. Yet we must also remember that Kocher (*Deut. Zeitschr. f. Chir.*, Bd. xxxvi. p. 72) has reported two cases of such porencephalic dilatation of the lateral ventricles that the choroid plexus and the corpus striatum were seen at the operation, yet they were drained for over three months and finally recovered.

The chapters on Cerebral Hemorrhage, and on Abscess and Tumor of the Brain, are excellent, and there is nothing except praise to be said of them.

In Chapter VII., Trephining for Hydrocephalus, the writer advocates trephining in every case, since, if the disease is primary, it may be cured; and if it is secondary to some other incurable affection the patient will die, and the operation will not necessarily hasten the fatal termination. We confess that this is rather more sweeping than we should advocate. The cases in which we have deemed it right to operate are comparatively few.

The chapter on Trephining for Insanity is very judicious.

The book, as a whole, is most creditable to American medicine, whether regarded from a neurological or a surgical standpoint, and we can commend it very strongly, especially as it will assist in diffusing among the profession at large a knowledge of cerebral localization and of the possibilities which cerebral surgery offers, either of alleviation or of cure. W. W. K.

LEÇONS DE THÉRAPEUTIQUE. Par GEORGES HAYEM, Professeur de Thérapeutique et de Matière Médicale à la Faculté de Médecine de Paris, Médecin de l'Hôpital Saint-Antoine, Membre de l'Académie de Médecine. LES MÉDICATIONES. Quatrième et dernière série. Pp. iv., 806. Paris: G. Masson, 1893.

LECTURES ON THERAPEUTICS. By GEORGES HAYEM, Professor, etc.

THIS volume concludes the series devoted to therapeutics. Commencing with the treatment of Dyspepsia, we find six hundred and forty-four pages assigned to this subject, which is presented not as is usual in a work on therapeutics—as a discussion of methods and means of treatment—but

it is as well a treatise on dyspepsia, its diagnosis, pathology, and clinical history. Hayem believes that the chemical examination of the contents of the stomach is comparable to auscultation and percussion, and its practice superior in that it does not admit of personal error, is mathematically exact and leaves little to the exercise of the senses. We submit, however, that since about three hours are required for a complete chemical analysis, the author fails to show that it presents the same range of adaptability to the practitioner as does the physical diagnosis of other physiological systems, although we most heartily indorse his plea for greater accuracy in the diagnosis of diseases of this most important system, the digestive. In his historical retrospect he is just to his predecessors, and in the wealth of literature his task is by no means an easy one. In making a chemical examination of the contents of the stomach he prefers Ewald's test-meal, with removal of contents by siphonage with Faucher or Debove tube. His method is that of C. Schmidt as modified by Winter. Estimations of chlorine are made as (1) free hydrochloric acid, (2) in organic combination, (3) in inorganic combination (fixed). Examinations are also made (1) for organic acids—lactic, acetic, and fatty—(2) for products of digestion—albuminous, amylaceous—(3) as regards pepsin ferment, (4) chemical power (Günzberg's test), absorption power, motor power, (*a*) salol, (*b*) oil. As for the tests under the last section, we would call attention to the work of Gley and of Cornet, which throw some doubt on the value of salol in diagnosis, and that the rhubarb test of Brunton is omitted. The presentation of modern physical diagnosis in dyspepsia is masterly, and deserves most careful study. He combats Ewald's dictum, that "free hydrochloric acid is the thermometer of the functional activity of the stomach," and takes into consideration pepsin as well, in building up his classification. With frequent charts, tables, and formulæ, this part of the subject is made clear and easy of comprehension. His symptomatology is cleanly cut, and in conciseness is worthy of our best old authors. He criticises Reichmann's gastro-succorrhœa, classifying the cases of dilatation without, however, underestimating the importance of this condition. He shows that gastralgia is often due to free hydrochloric acid, discusses flatulence, buccal dyspepsia, which excited so much interest a short time since, divides intestinal dyspepsia into cases dependent upon suppression or changes in (1) bile, (2) pancreatic fluid, and (3) intestinal fluids, treats of constipation, diarrhœa, enteroptosis, presents the accessory symptoms as shown in the eyes, ears, the migraines, somnolence, coma, tetany, disturbances of general nutrition, and closes with the urinology. He takes up the pathology, not omitting the rôle of the microbes, and endeavors to place the pathological anatomy as a basis for his symptomatology.

In taking up the subject of treatment, he begins with the hygiene. Taking Bauer's definition of digestibility or "the resistance of aliment toward digestive fluids," he gives milk a prominent place, as sedative, easy and rapid of digestion, and fixes its value by careful clinical observation supplemented by chemical tests. He gives the indications for the use of kumyss and kephir, but omits to mention matzoon, which is often preferred by patients to the more widely known kumyss. He has made a thorough study of the use of meats and vegetables, and shows his thorough disapproval of pastry by quoting Fonssagrives, "Les pâtisseries sont les officines de la dyspepsie." He gives rules and their application for the choice of diet, and presents the various "cures"

and methods, not even omitting Weir-Mitchell. On the subject of drugs he is not an enthusiastic advocate of massive doses of alkalies, but—the indications, based on careful physical examination, having been determined—he makes full use of them. The proper use of acids, bitters, including condurango, strychnine, the inhalation of oxygen, the caution as to the digestion of iron, are clearly and concisely presented. In the work upon digestive ferments he speaks of the French pepsins, with, perhaps, pardonable patriotism, as in general the best, but shows that they should be administered not with, but at a separate time from hydrochloric acid. We feel that he has not given sufficient attention to pancreatin, apparently believing that most digestive disturbances have their point of origin in the stomach. His presentation of papain is excellent, but we had reason to expect that he would have included the recent literature of the other digestive ferments of vegetable origin, notably those of the pineapple family (*Bromeliaceæ*). On the subject of disinfectants he states their advantages and their limitations as well, but clearly demonstrates their usefulness. Resorcin is omitted, which, perhaps, is pardonable, as its really scientific literature is quite recent. The literature of purgatives is excellent, although in minor points some would join issue—that their action depends so largely upon increased peristalsis preventing resorption of intestinal fluids, that concentration of solutions of sulphate of soda makes no difference in their action, and that hourly doses of calomel of from one to three and one-half grains should be considered fractional. Cascarin as an active ingredient of the valuable cascara-sagrada is omitted, and the use of the so called concentrated glycerin-sulphate of magnesia enema should have been mentioned at the same time as glycerin suppositories. In the use of lavage he does not recognize the dangers that have been pointed out by Fenwick. In other respects the section is complete. Massage receives due attention, and the subject of electricity, the various methods and forms, is carefully summed up in tabular form. The indications for the use of mineral waters are fairly given, and are based upon clinical observation. From pages 597 to 644 is found the synthesis of this portion of the work, giving in detail special indications for the treatment of each condition under the heading of dyspepsia. The work of Dujardin-Beaumetz, with which as a student in Paris we were familiar, marked an era in the development of the diagnosis and treatment of the diseases of digestion; the brilliant work of Ewald and his *confrères* was a decided advance. To-day this work on dyspepsia stands easily without equal in broad scientific spirit, careful literary criticism, and practical teaching for the physician.

The treatment of the symptoms of dyspnœa is covered in thirty-seven pages; the usual remedies, ether, chloroform, grindelia, pyridine, quebracho, lobelia, euphorbia, nitrites, and arsenic are considered. The remedies useful in relieving cough and expectoration are dismissed in twenty-nine pages—too briefly, we believe; although nothing new is presented, yet it is a fair presentation of the subject when it is taken into consideration that some of these remedies have been discussed in other lectures. In the forty-nine pages upon albuminuria we find many practical points, without, however, a large array of remedies; uræmia, in nine pages, receives careful attention for its special forms. The anhidrotics do not include any new substances, unless camphoric acid and tellurate of soda be so regarded, and yet in the eight pages we expected to find the old remedy, oxide of zinc.

Taken as a whole, this volume is eminently practical. Written in the form of lectures, it is very readable, the ancient history of therapeutics is briefly given, and authors are duly credited for their work, and their opinions fairly stated even when disagreed with. The work is modern, but few valuable methods or drugs are omitted, the material is well digested, and the treatment advised has for its basis physiology and careful physical examination. The general trend is not optimistic, but on the other hand the author has no sympathy with therapeutic nihilism. This fourth part amply fulfils the promises of its predecessors and is a credit to the vigorous, practical French school of medicine.

R. W. W.

FERMENTATION, INFECTION, AND IMMUNITY. A NEW THEORY OF THESE PROCESSES. By J. W. MCLAUGHLIN, M.D. Austin, Texas: Eugene Von Boeckmann, 1892.

IN the preface to this work the author states that, "While much valuable information has been acquired concerning fermentation, infection, and immunity, and various theories have been advanced at different times which explain, more or less perfectly, large groups of phenomena of these processes, it must nevertheless be admitted that these theories are all seriously defective."

The writer, then, in the following chapters, sets forth his new theory. After carefully reading the book, we feel like saying, "The new things in it are not true and the true things are not new."

Volumes have been written on this subject, and that after years of study and original research; and while these theories may be seriously defective, they are not to be brushed aside by mere statements which are not substantiated by careful and continued scientific research. The writer does not show that familiarity with his subject that one would expect when writing on that which is so complex.

Many errors which might be charged to the printer, if not for the frequency of occurrence, warrant us in making this assertion; most markedly inaccurate is the arrangement of pathogenic bacteria.

The subject is one too deep for the ordinary practitioner, yet the reader who is fairly familiar with the subject becomes here bewildered in the fog of words and complex sentences. The book shows that an immense amount of work has been done for which we must give the author credit, at the same time we cannot help saying that little has been accomplished.

The volume is neatly printed and handsomely bound. D. B. K.

PROGRESS

OF

MEDICAL SCIENCE.

THERAPEUTICS.

UNDER THE CHARGE OF

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The Diffusion of Certain Substances when Injected into the Blood.

Dr. J. Verhoogen has made some researches concerning the diffusion of toxic or medicinal substances in the organism. After subcutaneous injections of morphine in dogs, it was found that—whether the alkaloid was not uniformly diffused, or was more rapidly destroyed in different organs—it had accumulated by preference in the liver, in bone-medulla, and in the spleen. If the animal was killed before complete diffusion had taken place, the blood contained a very large amount, and the muscle hardly any, although even now the liver, spleen, and medulla were already charged with the poison beyond what was found elsewhere. Nor is the accumulation a consequence of the amount of blood contained in the organ, for the proportion of morphine is greater than that found in the blood. Experiments with iodide of sodium showed that the blood readily held this salt, and in greater proportion than the tissues. The liver shows a considerable accumulation, but only for a short time, because the elimination by the kidneys is rapid. The above results were determined by chemical analysis. With carbonate of lithia the spectroscope became available. By this method it was found that the salt rapidly accumulated in the liver, and was after some hours completely eliminated. It is evident that some tissues, as the muscular, pulmonary, and nervous, have but little affinity for the alkaloid, while others—liver, spleen, and medulla—take up amounts greater than those found in the blood. In the case of the salt, muscle and nervous tissues yield but little by analysis; the liver contains considerable, but the greater portion remains in the blood and passes directly into the urine. The localization of these substances in the liver is not due to its situation, for other vascular glands possess an analogous power, and this is even true of medulla. The liver is the organ in which

chemical changes are actively and incessantly carried on, and with these changes going on we find the alkaloids retained in the liver and modified by it. That strychnine, quinine, and nicotine are thus acted upon was shown by Jacques. That the same is true of hyoscyamine is now shown, although a certain time is required for the modification to be complete, so that its physiological properties are lost. Whether the chemical action is the same for all alkaloids, and what this action is, and whether like changes take place in other organs when accumulations are found, are problems that at present cannot be solved. —*Journal de Mêdecine, de Chirurgie, et de Pharmacologie*, 1892, fasc. 2 et 3, p. 197.

Salol as an Intestinal Antiseptic.

Dr. E. Mansel Sympson has found in cases of duodenal indigestion that a preliminary four or five grain dose of calomel, followed in an hour by ten-grain doses of salol every four hours "acts like a charm." In infective diarrhœa this remedy is exceedingly useful. In ordinary diarrhœa there are few remedies which will more speedily check the flow and pain than ten-grain doses of salol. In typhoid fever he uses this remedy, not so much with the idea of combating the specific poison, but of cleaning and keeping clean the intestinal tract, and so subduing the irritation of the glands of Peyer's patches and other ulcers there, and that caused by the secretion from these ulcers in the intestine. It also prevents the excessive formation of wind, which is sometimes so vexatious a trouble to the patient. The temperature is generally brought down a degree or two, and there is abundant respiration. No bad effects were noticed in regard to delirium. The amount given was ten grains, suspended by means of compound tragacanth powder, every four to six hours, and during the last week three times a day after food.—*Practitioner*, 1893, No. 302, p. 102.

A Study of Aseptic Pepsin.

Dr. Adolph Gehrmann believes that the least that can be required of such pepsins is that they shall contain no living or viable organisms; partial sterility will not suffice. Theoretically it may be argued that in the preparation of predigested food, the milk or other ingredients of the food must remain uninjured by bacterial growth; that when added to sterilized milk the milk will remain sterile, or when administered as pepsin no bacteria are placed in the stomach to menace an already diseased digestive tract. The pepsin and the prepared foods, administered under the same exact technique that preserves sterility of culture material in the laboratory, would offer valuable results. Practically such administration is impossible; the opportunities and chances of infection are numerous. The ordinary means of sterilization cannot be employed in the preparation of pepsin, which is a highly sensitive, unorganized ferment, becoming inactive after a short exposure to a temperature of 128° F., and being injured by contact with most antiseptics, alcohol soon rendering it inert. Being an albuminous body, it offers an excellent nutrient material for bacterial growth. Heat-sterilization can only destroy a small part of the organisms contained without destroying the pepsin. Evaporation in a vacuum will not sterilize pepsin in solution, because

bacteria readily resist absence of oxygen, and some even, being anaërobic, would enjoy the new condition. Sterilization by gases has also been proposed, more particularly by sulphur dioxide gas, but the difficulty of effectual application makes it of doubtful value. Eleven samples of aseptic pepsins were examined, and it was found that in the agar tubes cultures regularly appeared; they were also obtained from the flasks of sterile water, and milk became decomposed in from two to ten days. In a few instances determinations of the digestive power of the samples were made. It was found that they were usually of very high grade, products of unusual activity from which most of the dirt usually present had been removed; they are clean but not aseptic preparations. He concludes: 1. Aseptic pepsin is only of value in theory. 2. It is impossible to sterilize pepsin by the usual methods. 3. The aseptic and similar pepsins now offered to physicians are not aseptic, viable cultures being regularly obtained from them. 4. The pepsins in question are simply clean preparations of high-grade dissolving power.—*The North American Practitioner*, 1893, No. 5, p. 219.

Direct Electrization of the Stomach.

Dr. Max Einhorn records his further experience with the deglutable electrode, submitting the following as a *résumé*: Physiologically—1. Direct gastro-faradization ordinarily increases gastric secretion, even during the first period after electrization. 2. The absorbent faculty of the stomach is considerably accelerated directly after the gastro-electrization (faradization and galvanization). Therapeutically—1. Direct gastro-electrization is a potent agent in the field of chronic (non-malignant) diseases of the stomach. 2. Gastro-faradization appears especially useful in most cases of dilatation of the stomach and enteroptosis; further, in atonic conditions of the cardia (ructus) and pylorus (presence of larger amounts of bile in the stomach), and in chronic gastric catarrh (gastritis chronica glandularis). 3. Gastro-galvanization is almost a sovereign means for combating severe and most obstinate gastralgias, no matter whether their origin is of a nervous nature or caused by a cicatrized ulcer of the stomach. 4. Gastro-galvanization exerts also a favorable influence on several affections of the heart complicated with gastralgia.—*New York Medical Journal*, 1893, No. 762, p. 29.

Enteroclysis in the Summer Diarrhœa of Children.

Dr. R. E. Müller gives the results of laboratory investigations, and reports seventy-eight cases, classified as 1, simple; 2, infectious diarrhœas. The simple diarrhœas constitute a small percentage, being symptomatic of derangement of function in the intestinal tract, unaccompanied by fever, and without involvement of the stomach. These cases respond readily to intestinal irrigation with cool or tepid water, and often to enteroclysis with a saline solution, followed by a restricted diet. The infectious diarrhœas are subdivided into three forms—the mild, the severe, and the choleroid. They depend upon ptomaïne poisoning, the toxic matters being formed either in the milk, outside of the body, or in the intestinal tract, from bacteria introduced with the milk. The first indication embraces the sterilization of the

milk, the second the support of the patient until the toxic matters are thrown off—that is, alcohol, either as whiskey or brandy, in almost all cases. He concludes: 1. That intestinal irrigation may be considered a valuable adjunct in the methodical treatment of suitable cases of summer diarrhœa. 2. That irrigation with cold or iced water will lower the temperature of the lower part of the abdomen by direct refrigeration of the blood-mass, and the procedure is indicated when high temperature, lasting for a considerable time, endangers life by coagulating the cerebral fluid or cardiac protoplasm, or when accumulation of feces, mucus, etc., in the bowel causes a continued irritation of its mucous membrane. 3. That the dangerous effects of the poisonous animal alkaloids are either diminished, or counteracted, or dissipated by irrigations. 4. That the influence on the circulatory apparatus is shown by the change in the pulse, which becomes less frequent and stronger. 5. That systematic enteroclysis results in an amelioration of the symptoms and a shortening of the course of the affection, and will often overcome the semi-paralytic condition of different organs. 6. That the resistance which the fever offers to its reduction by this method is an index of the gravity or mildness of the case.—*Therapeutic Gazette*, 1893, No. 7, p. 433; No. 8, p. 54.

Salacetol in the Treatment of Diarrhœa.

Dr. Bourget presents his studies upon this remedy, which is a combination of salicylic acid and acetol, and possesses all the chemical and physiological properties which make salol an intestinal disinfectant of the first rank. It is a white crystalline powder, insoluble in cold water; is first decomposed in the alkaline fluids of the small intestine; the salicylic acid accomplishes the asepsis and the acetol is rapidly eliminated as acetone. This remedy contains 75 per cent. of salicylic acid against the 60 per cent. of salol. It apparently eliminates the salicylic acid more rapidly in a solution of castor oil because the latter provokes a more abundant secretion of the intestinal fluids. He has treated a large number of infectious diarrhœas, and on only one occasion was he obliged to resort to laudanum. The dose is thirty to forty-five grains in an ounce of castor oil, taken in the morning, fasting. Rarely is it necessary to be repeated on the following day, although no inconvenience results should it be repeated. Under this dosage the sulphur compounds (indican, cresyl-sulphates, skatoxyl-sulphate) are diminished and reach their normal (one-tenth of the simple sulphate) within three or four days, showing that disinfection is rapid. Good results were also obtained with this remedy in subacute and chronic rheumatism.—*Correspondenzblatt für Schweizer Aerzte*, 1893, No. 14, S. 481.

Creasote in Tuberculosis Pulmonum.

Dr. J. T. Whittaker has carefully reviewed the literature of this remedy He concludes: 1. Creasote, when pure, is harmless. 2. It has no direct action upon the tubercle bacillus. 3. Tuberculosis pulmonum is chiefly a secondary infection by a streptococcus. 4. Creasote has no direct action upon this streptococcus; hence none whatever upon hectic fever. 5. It destroys lower organisms, especially those which produce fermentation, with-

out affecting the process of digestion. 6. The beneficial action of creasote, which is undeniable in most cases, is chiefly, but not wholly, upon nutrition. —*Therapeutic Gazette*, 1893, No. 7, p. 438.

The Treatment of Tuberculosis in Children.

Dr. Clemente Ferreira finds that creasote administered by the mouth is generally remarkably well borne, whether in pill form or as drops in milk, by very young infants. The daily dose is increased to the limit of seven grains without giving rise to any digestive or urinary disturbances; on the contrary, the appetite improves and the nutrition is bettered, the weight gradually increasing. The local signs gradually diminish, and after four to six months are difficult to detect. Used hypodermatically in sterilized olive oil, sometimes with iodoform, creasote produces excellent results, but more slowly than when given by the mouth. In addition, the possibility of local accidents, and the interference of the mothers, who regard the injections as painful, are reasons which limit this method to exceptional cases. Guaiacol can be administered by way of the mouth in astonishingly large doses. After a time the daily dose of sixty grains can be attained, and that without gastro-intestinal disturbance. In general the results are equally good as with creasote, the large doses being better borne. Hypodermatic injections do not present the advantages which compensate for the inconveniences of the same. Aristol administered hypodermatically to seven grains per day has not given either general or local improvement; nor by the mouth have the results been so marvellous as those obtained by Nadaud in adults. Iodoform is frequently of great usefulness, but it must be continued for a long time and frequently develops an intolerance which necessitates its interruption. The cantharidate of potash, used in doses of $\frac{1}{210}$ of a grain, hypodermatically, and repeated every six days, has been well borne, the kidneys not showing any disturbance. The local signs have improved, and in one of the two cases the general condition was benefited. The method of Lannelongue (injections of chloride of zinc) was used in two instances. In the one the local manifestations (tuberculosis of submaxillary glands) underwent a remarkable diminution; in the other (tuberculosis of the hip) an abscess resulted, which was aspirated, and improvement resulted from the administration of creasote in increasing doses. —*Bulletin général de Thérapeutique*, 1893, 28. livr., p. 68.

Gallobromol.

Dr. Lépine states that this is the pharmaceutical name for dibromo-gallic acid, which has the chemical formula $C_6Br_2(OH_3)CO.OH$. It is gallic acid in which two atoms of bromine have replaced the two remaining hydrogen atoms of the benzin radical. It occurs as fine white needles, very soluble in alcohol, ether, and boiling water, and sufficiently soluble in cold, so that it can be administered in solution. Internally it is prescribed in wafers in dose of seven grains. Thus administered it may give rise to gastric heaviness, and it is better exhibited in gooseberry syrup. It is used as a bromide in epilepsy, for the purpose of diminishing the attacks. Basing an opinion upon a small number of cases, it appears to be less efficacious than the potash salt—perhaps,

even, it is harmful. In other conditions, notably a case of chorea, which is not likely to be much benefited by the bromide of potash, it seems to be of use. Although an organic combination of bromide might be assumed to be less likely to be dangerous than an inorganic salt, yet it is emphatically stated that caution must be observed, and that two drachms and a half per day is to be used with care; and that three and one-half drachms is an enormous quantity.—*La Semaine Médicale*, 1893, No. 40, p. 313.

Functional Modifications produced by Apocodeine.

M. L. Guinard has found, in his physiological studies, that the action of this drug upon the heart (dogs), after a primary acceleration, is one of slowing, without modification of force or rhythm, and that the normal irregularities are lessened in number. This slowing is entirely of central origin, and takes place by way of the pneumogastric. Its effect upon the vascular system is to diminish pressure rather from the slowing of the heart than from active vaso-dilatation. As to the respiratory movements, there is at first a brief period of acceleration followed by a slowing which becomes more and more marked and attains its maximum during sleep, which is calm during the period that the respiratory and cardiac movements are undergoing a pronounced slowing. There is also a progressive lowering of the temperature which accompanies the sleep, and equally a diminution of the amount of carbonic acid gas in the respiration, as well as of the oxygen absorbed by the lungs. The lowering of temperature depends chiefly upon the muscular repose, but also upon the slowing of the heart and respiration, and the slight diminution of the intra-organic combustion. Upon the glands it can be said that there is a salivary hypersecretion, and also an increase of the biliary, pancreatic, and intestinal secretions. It appears certain that this hypersecretion is not the result of an action upon the glandular elements any more than upon the terminations of the excito-secretory nerves. Through its action upon the sympathetic ganglionic centres, there is a considerable exaggeration of intestinal peristalsis. From the preceding experiments it is apparent that this drug acts strongly upon the nervous structures. Since direct experimentation shows that it has an elective action upon the brain, which is at first depressant, but not exclusively here—it can as well influence the medulla or bulb. With larger doses, or more rapid administration, convulsive movements may ensue. Upon peripheral nerve elements we find also the depressing effects. At the point of injection is obtained a motor and sensory paralysis and a gradual, progressive enfeeblement of the muscles of other regions. This result probably takes place through the nerves, these being the last to be affected, the higher nerve centres being the first. From these observations it is apparent that this remedy can be a valuable synergist to the anæsthetics.—*Lyon Médical*, 1893, Nos. 29, 354; 30, p. 391; 31, p. 433; 32, p. 464.

The Changes in the Urine after Administration of the Glycerin Extract of the Thyroid Gland.

Dr. William M. Ord and Mr. Edmund White have very carefully observed the urine of a patient suffering from myxœdema, while undergoing

this treatment. They conclude: 1. That the urine is increased in volume. 2. The nitrogen excreted in the urine exceeds the total quantity of nitrogen in the food. 3. The phosphoric acid and chlorine elimination are practically unaffected. 4. The increased nitrogenous excretion is chiefly in the form of urea. 5. The body weight is rapidly diminished. 6. The temperature of the body is raised.—*British Medical Journal*, 1893, No. 1700, p. 217.

Tetanus treated by Serum.

Prof. Moritz reports a single case, with comments upon the existing literature, especially that of Behring. A twelve-year-old boy, who was placed under treatment eight days after the first symptoms were noticed, completely recovered in a month. In this case, although the symptoms were unmistakable, the point of entrance and the time of infection could not be determined. Presumably this was a chronic form of the disease, and on that account, of a more favorable prognosis.—*Münchener medicinische Wochenschrift*, 1893, No. 30, S. 561.

The Serum-therapy in Variola.

Prof. B. Auché believes that in this disease we have an opportunity for the success of this method of treatment. The serum was obtained from a healthy man who had suffered from a discrete and moderately intense variola six weeks before. For the second case it was obtained from a young man who had recently recovered from a slight discrete variola, the interval of time not being stated. In the first case the disease appeared with grave general symptoms, the eruption developed in the usual manner, but after the injection of the serum the eruption was checked in its progress and suppuration did not take place. As the patient had never been vaccinated, the conditions were favorable for a severe type of the disease. In the second case, although a larger dose was administered, the progress of the disease was unchanged. Perhaps the cause of the failure was the lateness of the injection—too late to abort the disease. The results of serum-therapy in man do not coincide with those found on experimentation with animals. The explanation of failure in the former instance is to be found in the fact that an accurate diagnosis is not obtained and the treatment begun until the disease has been thoroughly established and the system completely invaded. The amount of serum used was one and a half to two drachms injected into the buttocks. —*Archives Cliniques de Bordeaux*, 1893, No. 7, p. 317.

Ether Narcosis.

Dr. N. Kaefer reports one hundred and fifty cases which he has carefully studied. He believes that the greatest demands in ether narcosis are made upon the organs of respiration. Although it is easier to watch the respiration, yet it is undoubted that many pulmonary conditions are contra-indications to the exhibition of ether. The great advantage is admitted in the favorable influence upon the heart. That it is inflammable is a disadvantage. The duration and frequency of the stage of excitement as compared with that of chloroform, he does not determine. He concludes by advising the use of

ether, not entirely prohibiting chloroform, but limiting its use to the minimum.—*St. Petersburger medicinische Wochenschrift*, 1893, No. 25, S. 233.

The Administration of Chloroform in Hyderabad.

Mr. M. G. Naidu believes that this administration has been reduced to a fine art at Hyderabad. If the patient's respiration is kept regular and normal during the inhalation, the anæsthesia will be normal and free from risk. The heart and pulse are entirely ignored as regards the effect of the chloroform, and the aim of the chloroformist, whilst producing complete anæsthesia, is to see that there is never throughout the whole administration the smallest possibility of the patient inhaling an overdose. The inhalation should be begun gently with quiet, natural breathing. The cap should be removed with the establishment of complete anæsthesia. The abolition of the corneal reflex is the safest guide to this under ordinary circumstances. The drug should not be pushed to the extent of producing stertorous breathing, unless this occurs incidentally at an early period. In the ninety-one cases where chloroform was used, full anæsthesia was produced in the average time of less than three minutes, and the average amount employed for each case was 2.7 drachms.—*Lancet*, 1893, No. 3650, p. 365.

Methylene-blue.

Dr. A. Matienzo reports, in a paper read before the Medical Academy of the City of Mexico, nine cases of intermittent fever in which he has used this drug. He concludes from these observations, and from the results obtained in experiments upon the blood—1. That methylene-blue has a quick and sure antiperiodic action on malarial fever, causing the access to disappear in the majority of cases. 2. That it can be substituted for quinine in many cases where the latter is indicated or where it has no effect. 3. In serious cases of malarial infection, especially in pernicious manifestations, quinine should always be preferred.—*Reprint, La Gaceta Médica*, 1893.

M. G. Richard d'Aulnay has used methylene-blue as a remedy for different infectious diseases, and particularly in purulent vaginitis. Nine cases are reported in considerable detail. The formula is: Methylene-blue, 10; alcohol, 15; potash, 0.20; water, 200, which is used for moistening the tampons of absorbent cotton. In the different uses which he has made of this remedy in lesions of the mouth, fistulous tracts, in the urethra in women, and particularly in vaginitis, he has found it to act directly as a bactericide. In vaginitis the method of application is simple, the results excellent in the cessation of discharge and relief of pain.—*Bulletin général de Thérapeutique*, 1893, 18. livr. 396.

Kava-kava in Gonorrhœa.

Dr. John E. Bacon has studied the physiological action of the drug, which contains a crystalline principle, methysticin, and an acrid resin, kavin. He has used a fluid and a solid extract of the root. A full dose of the fluid extract gives rise to a pronounced anæsthesia of the tongue and mucous membrane of the mouth and throat, lasting ordinarily about an hour. No

irritation is produced by the fluid extract, but the solid, brought in contact with a mucous membrane, causes considerable pain, followed after a time by a complete loss of sensibility which persists for a period varying from twelve hours to three days. Therapeutic doses of the fluid extract (one-half to one drachm every four hours) increase the force and frequency of the pulse, increase the amount and diminish the specific gravity of the urine, and render it alkaline. He reports eighty-two consecutive cases of gonorrhœa. It relieves the *ardor urinæ*, scalding, and painful micturition, and by its anæsthetic effect lessens the pain and irritation. It will control and cure an ordinary case in from fifteen to thirty days without recourse to any topical treatment. He believes that it does this by controlling the symptoms, and by a certain antiseptic action due to its intense alkalinity. Stricture very rarely follows an attack. In five cases only did failure occur, and in these the urine remained acid in spite of large doses of the remedy.—*American Therapist*, 1893, No. 12, p. 304.

[To those who have confidence in the internal treatment of gonorrhœa we commend this paper. This remedy has enjoyed an excellent reputation in France for many years, and our observations, in the main, confirm the conclusions presented.—R. W. W.]

Pichi—a Remedy for Diseases of the Urinary Organs.

Dr. M. Friedlaender has used this remedy in the dose of a teaspoonful of the fluid extract, thrice daily, either clear or with a little sugar. The taste is not disagreeable, nor does it give rise to digestive or renal disturbances, or eruptions, as do balsam of copaiba or oil of sandalwood. He has employed it for cystitis, prostatitis, neuroses, acute gonorrhœa, and epididymitis. He has found this remedy to be especially useful in conditions of marked purulent discharge, as gonorrhœa and cystitis.—*Therapeutische Monatshefte*, 1892, Heft 7, S. 350.

Oxychinaseptol as an Antiseptic.

Dr. C. Steinmetz records his experience with this drug, otherwise known as diaphtherin, which he has used in about forty cases within three months. It appears to be as serviceable as other antiseptics, for example sublimate, in a 1 per cent. solution for irrigation and moist dressings. If a caustic action is desired, it can be used in from 10 to 50 per cent. ointment with vaseline, and this may be necessary in sluggish wounds. It is useful also as a 1 per cent. gauze, either in primary wounds or after curetting. Eczema occurred in only one instance, and that in a child predisposed to this disease. Although it is soluble in water, it presents the disadvantage of staining instruments and coloring the nails yellow. No symptoms of poisoning have been observed.—*Münchener medicinische Wochenschrift*, 1893, No. 31, S. 582.

The Action of Sodium Oxalate on Voluntary Muscle.

Mr. F. S. Locke finds that frog's muscle immersed in a 0.75 per cent. sodium oxalate solution, becomes in a few seconds violently active, undergoing an exaggeration of the movements of similar muscle in a "normal saline

solution." In the course of one-half to three quarters of an hour it becomes motionless, but does not pass into rigor, being little if at all shortened, and retaining all the flexibility and other characteristics of still living muscle. The addition of a small percentage (0.025–0.1) to a pure 0.6 per cent. sodium chloride solution increases greatly its chemically stimulating action, and equally, what may be termed for shortness sake, its veratrine-like action. In all probability this action of sodium oxalate explains the *fibrillares muskelzucken* and *starkes muskelzittern*, which as a symptom of sodium oxalate poisoning has hitherto been ascribed to its action on the central nervous system.—*Journal of Physiology*, 1893, Nos. 1 and 2, p. 119.

The following papers are worthy of notice:

"The Latest Investigations of the Pharmacology of Iron," by DR. A. JAQUET, in the *Correspondenzblatt für Schweizer Aerzte*, 1893, No. 13, S. 449. A careful study of this important subject, bringing the literature up to date.

"The Action of the Trionals," by DR. KOPPERS, in the *Internationale klinische Rundschau*, 1893, No. 24, S. 1082. A very complete and favorable clinical report.

"The Therapy of Nutrition," by DR. E. LEYDEN, in the *Deutsche medicinische Wochenschrift*, 1893, No. 22, S. 513. A statement of existing theories, but hardly definite enough to be of practical value.

MEDICINE.

UNDER THE CHARGE OF

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REFLEX HEMIANASARCA.

RENDU (*La Semaine Médicale*, 1893, No. 41, p. 321) has reported the case of a man who was seized with pain in the left side and posteriorly—at first dull, but subsequently sharp. He continued at his work, complaining, however, of headache, pain in the back, indigestion, anorexia, constipation, and a little cough; at night there was a little fever. At the end of three weeks the man presented a prominence at the base of the left half of the chest, with dulness on percussion; below the left clavicle the percussion note was tympanitic. Vocal fremitus was diminished; the heart was not displaced; at the angle of the scapula, blowing breathing and bronchophony were to be heard, but no ægophony and no pectoriloquy. In the area of dulness the breath

sounds were feeble; râles could not be heard. Upon the right side some fine râles were heard at the base, with some impairment of the percussion resonance. In the præcordium pleuro-pericardial friction sounds could be heard. The heart was normal and the urine contained no albumin. By exclusion, a diagnosis of spleno-pneumonia of influenzal origin was made. Remittent fever, with vesperal exacerbations, persisted, notwithstanding the administration of quinine sulphate and the application of a blister to the chest. The pleural friction sounds disappeared, but the pulmonary signs and the dyspnœa persisted. The temperature remained slightly elevated. The bronchial breathing extended from the scapula to the base of the lung. Applications of wet cloths to the chest afforded relief, but interfered with perspiration. Finally, there suddenly developed, without appreciable cause, an œdema of the chest-wall at the level at which the blowing breathing was heard, extending thence to the lumbar region and to the left thigh. At the same time local fremitus disappeared, the vesicular murmur became enfeebled, and ægophony was heard in a circumscribed area. Exploratory puncture disclosed the existence of a serous effusion of small volume. The œdema extended, progressively involving the trunk, the scrotum, the buttocks, the thighs, and the legs, predominating, however, upon the left side. Heart and urine still presented no abnormality. Fever persisting, the dyspnœa and the general condition becoming more distressing, and the fluid continuing to accumulate, a portion of the effusion was evacuated by puncture. Dry cups, scarification, digitalis, purgation, and a milk diet were followed by no improvement. The fever, however, ultimately subsided, leaving anorexia, emaciation, cachexia, and anasarca, while the signs of pleural effusion became more and more pronounced, until the vocal fremitus had entirely disappeared and the breath sounds could no longer be heard. Râles were heard at the base of the lung, but the heart was not displaced. The removal of some six ounces of fluid was followed by considerable relief. Thereafter the morbid phenomena gradually receded, the flow of urine became progressively augmented, and the œdema gradually disappeared. Sleep and appetite returned and recovery ensued. The duration of the illness was about eleven weeks. The œdema is explained upon the basis of a reflex paralysis of the vasomotor nerves of the affected regions secondary to the pulmonary condition.

A Case of Cerebral Syphilis.

Brousse (*Montpellier Médical*, 1893, No. 4, p. 608) has reported the case of a woman, twenty-two years old, who was found at the foot of her bed, semi-comatose and unable to move or to explain her condition. Examination disclosed the existence of a complete left hemiplegia, involving the face as well as the extremities, but without anæsthesia; there seemed to be a slight degree of hyperæsthesia upon the left side. The muscles of the upper part of the face and the ocular muscles were not involved; the pupils were dilated. No lesion of the heart or great vessels was to be detected. The woman presented numerous syphilitic stigmata. There were large patches of discoloration upon the anterior aspect of the chest and eruptions of diverse character and at different stages upon the thighs and legs, as well as the remains of healed gummata, and on the left thigh a gumma in process of

ulceration. Mercurial inunctions were at once instituted and the administration of potassium iodide begun, while mercurial plaster was applied to the ulcerating gumma and a gargle of potassium chlorate was prescribed. In the course of a few days intense stomatitis with copious salivation developed, and the mercury had to be withdrawn, the iodide, however, being continued. Appropriate treatment was directed to the condition of the mouth. The woman's condition meantime improved. The apoplectic condition began to recede, and she was soon able to give an account of herself. It was learned that her mother had died in attack of apoplexy at the age of forty-five years. She herself had acquired dissolute habits at the age of sixteen, and at the age of seventeen contracted a chancre of the left labium minus. Subsequently there developed a malignant syphilis of rapid evolution. For several years there had been intermittent headache, which later became dull and persistent and was referred particularly to the right frontal region. There was neither vertigo, convulsions, nor impairment of vision. For a year menstruation had been entirely suppressed. After a night of excessive venery the woman was overcome and fell at the foot of her bed, although consciousness was not entirely lost. In this condition she was found, defiled by her urine and her stools, which she had involuntarily passed beneath her. The woman believed that the attack coincided with the time for the occurrence of menstruation. In the further progress of the case subcutaneous injections of mercury benzoate were instituted, the iodide being at the same time continued. With this treatment there was progressive improvement as regards motility, but the general condition remained poor. At the end of twelve weeks, without apparent cause, a violent epileptiform attack occurred, and was soon followed by others in rapid succession. The attacks were characterized by clonic convulsions in the extremities of the right side, with tonic spasm of those of the left, and conjugate deviation of the head and eyes to the left. The action of the heart was at the same time extremely rapid, and there was profound depression, but there was no elevation of temperature. Some relief was afforded by the subcutaneous injection of ether and the administration of bromide. These attacks were followed by great weakness and an increase of the left-sided paresis. From this time the condition of the woman grew progressively worse. Right-sided pneumonia developed, which was thought to be tuberculous, although repeated examination of the sputum failed to disclose the presence of tubercle bacilli. Troublesome diarrhœa additionally set in; the state of weakness grew more profound, and death took place amid the symptoms of asphyxia. At the post-mortem examination the calvarium and the cerebral membranes presented no abnormality other than a notable thinning at the anterior superior angle of the parietal bone of either side, and a depression of the dura mater in the right frontal region. There was a large subdural accumulation of sero-sanguinolent fluid and injection of the pial vessels, particularly in the Rolandic region. There was also generalized cerebral œdema. To the touch the right Sylvian artery conveyed the sensation of a hard cord; its walls were greatly thickened. At the root of the third right frontal convolution was a circumscribed area of yellow softening, about as large as a nut, extending deeply and involving somewhat also the adjacent ascending frontal convolution. There was another, but smaller and superficial area of softening at the posterior ex-

tremity of the right Sylvian artery involving the angular gyrus. On making sections of the brain an extensive area of softening was found involving the anterior two-thirds of the caudate and lenticular nuclei, as well as the anterior limb of the internal capsule and the motor zone of the centrum ovale. The posterior third of the posterior limb of the internal capsule escaped. Pons, medulla, and cord presented tracts of descending degeneration. The right lung was adherent to the costal pleura. It presented the appearance of a fibro-caseous mass and was filled with yellowish miliary granulations, particularly confluent at the apex. The bronchi were filled with pus. The left lung was congested, particularly at its apex, but presented no granulations. During life it was thought the symptoms were dependent upon the presence of a gumma in the brain, but the autopsy demonstrated that the pathologic process was essentially a syphilitic endarteritis leading to anæmic softening.

Generalized Tuberculosis especially affecting the Serous Membranes.

Sergent (*Bull. de la Soc. Anat. de Paris*, t. vii., sér. 5, f. 15, p. 361) has reported the case of a girl, eleven years old, whose father had died at the age of thirty-three years with bilateral pneumonia, and whose maternal grandfather had been tuberculous. When eighteen months old the child had had convulsions for a week. From the age of seven to nine she had had slight epistaxis almost every morning. At the age of eight she had had whooping-cough lasting for three months, and at nine years she had had measles. For two months it had been observed that the child was rather depressed and always tired, complaining a good deal of pain in the thighs. Appetite was lost, and almost everything that was swallowed was rejected. There was almost constant headache. Emaciation and debility were quite pronounced. There was pain in the abdomen, but no tumor could be detected upon palpation, though there was evidence of the presence of fluid in the peritoneal cavity. The liver extended a finger's breadth below the margin of the ribs, but was not painful upon manipulation. The area of splenic percussion dulness was not increased. There was little cough, without expectoration; there had never been hæmoptysis. There was no dyspnœa and no thoracic pain. The pulmonary percussion resonance was slightly impaired at the summit of the chest; the breathing was roughened, and some fine râles were to be heard. The heart-sounds were feeble and distant. There was no palpitation and no præcordial anxiety. The pulse was rapid and small, and intermitted occasionally. The urine presented no abnormality. The bowels were constipated. The temperature, a little elevated, rose higher and became irregular and oscillating. Dyspnœa and pain in the chest later set in. An area of dulness became apparent in the outer part of the right infra-spinous region, and here the breathing was bronchial, and crepitant râles were to be heard. Later, pleural friction sounds were to be heard upon the right, and crepitant râles in other parts of the right lung and also in the left lung. The abdomen became progressively more and more distended and painful, while the dulness in the dependent portions became more pronounced. Finally, the patient was seized with convulsions, loss of consciousness, and anæsthesia. The attack lasted about two minutes, and was followed by copious perspira-

tion. An hour later a second attack occurred, and in the course of the day four others. Death took place at night during the ninth paroxysm.

At the necropsy two quarts of sero-purulent, flocculent fluid were found in the abdominal cavity, the walls of which, and loops of intestine as well, were in places lined by false membrane. The liver was large, fatty, and friable. The spleen was of usual size, deep-red in color and rather deficient in consistency. Upon its surface were numerous disseminated yellowish granules. The kidneys presented little change beyond congestion. The jejunum and ileum contained several small superficial ulcers, marked at the periphery by little granulations visible upon the peritoneal surface. At the junction of ileum and cæcum there was a confluent mass of granulations also visible upon the peritoneal surface. The visceral peritoneum presented many granulations, and the mesenteric glands were enlarged. The right pleural cavity contained a small quantity of sero-purulent fluid. The right lung was extensively adherent to the parietal pleura, especially posteriorly and at the lower part of the upper lobe. At this point there was a thick layer of pseudo-membranes, in the midst of which was a large number of granulations. The lung beneath this, in an area perhaps equal to that of a small orange, exhibited a condition of caseous pneumonia. Adjacent to this, both superficially and profoundly, were numerous granulations, diminishing in number as this focus was receded from. Elsewhere upon the surface of the lung were scattered granulations, most marked, however, at the interlobular fissures. The left lung presented a small number of scattered granulations. The tracheal and bronchial glands were enlarged and caseous. At the hilus the right mediastinal pleura and the pericardium were adherent. The pericardium was distended to the size of a fœtal head, and was in part covered by the left lung. An incision evacuated nearly two pints of hemorrhagic fluid. The membrane was lined by fibrinous exudation, beneath which many tuberculous granulations were visible. The heart was dilated, the myocardium flabby; valves and orifices were normal. The convexity of the brain was congested and presented slight exudation in the course of the pial vessels. In the anterior perforated spaces, and accompanying the Sylvian arteries, a number of granulations were visible. Tubercle bacilli were found in the pulmonary and pericardial lesions.

Aneurism of the Arch of the Aorta; Rapid Death by Asphyxia, Without Notable Obstruction of the Respiratory Passages.

Siredey and Dalché (*Revue de Médecine*, 1893, No. 7, p. 642) have reported the case of a charwoman, fifty-six years old, whose mother had died of carcinoma of the stomach at the age of forty years, and whose father had died anasarcous, but who, herself, presented no history of enteric fever, scarlatina, impaludism, syphilis, or other disease having a causative relation to affections of the circulatory apparatus. She had never borne a child nor had she had a miscarriage. Alcoholic excess was denied, although for several years there had been gastric derangement, with dyspeptic symptoms and disturbed sleep. There was epigastric pain following the taking of food, and headache was frequent and troublesome. There was slight cough, with other symptoms of bronchitis. For six or eight months there had been almost

constant oppression of the chest, with paroxysmal exacerbations, together with retro-sternal pain at the upper part of the chest. The cough later occurred in attacks frequently, and the oppression became almost intolerable upon the slightest exertion. At the same time some little difficulty was experienced in glutition, and at times actual crises occurred, preventing the ingestion of solid food. At this time there was no sign pointing to disease of the vascular apparatus. Shortly, however, there appeared a globular tumor at the upper part of the sternum, presenting slight pulsation and having its long diameter transversely. The tumor was elastic to the touch, and transmitted an expansile pulsation, but no thrill could be detected. The skin in front of the tumor became reddened, œdematous, and painful upon the slightest pressure. Numerous small varicose vessels made their appearance upon its surface. The superficial veins of the anterior thoracic wall were but little enlarged. There was no œdema of the neck or upper extremities. The face was a little injected and reddened; the eyes were somewhat prominent; the left pupil was occasionally a little larger than the right. The pulsation of the transverse aorta could be felt at the supra-sternal notch, but that of the innominate, the left carotid, and the left subclavian did not appear unduly strong or superficial; the latter may indeed have been a little weaker and more profound than usual. The heart did not appear to be hypertrophied. The sounds were normal at the apex, but at the base a soft systolic murmur could be heard, transmitted to all parts of the tumor. Careful auscultation failed to detect more than this single murmur. The two radial pulses appeared to be synchronous and equal, though the right may perhaps have been a little stronger than the left. The voice had a peculiar timbre; the cough was dry and rough, but not aphonic. The breath-sounds had a bronchial character, most pronounced posteriorly at the root of the lungs, and more so upon the right than upon the left. The two most distressing symptoms were dyspnœa and dysphagia. Almost continuous, the dyspnœa was aggravated upon slight exertion, and attended with pronounced inspiratory bruit and transitory cyanosis of the face. The dysphagia was frequent, but most capricious in its occurrence. The urine presented no abnormality. In the further course of events the right arm became swollen and painful, and the right breast was also the seat of pain. Later, the right breast and then the right half of the thorax became œdematous. Symmetrical swelling of the neck and face developed, more marked, however, upon the right. The patient was finally compelled to go to bed, her distress being aggravated by every movement. Matters went from bad to worse, and amid the symptoms of progressive asphyxia death rather rapidly took place. At the post-mortem examination some ten ounces of serous fluid were found in the right pleural cavity, without other indication of pleurisy. The pericardial cavity contained less than four ounces of fluid, and presented a small amount of false membrane at its upper part, where it was also gently adherent in places to the aorta. The heart was not hypertrophied. The ventricular wall was rather soft, but there was no lesion of valves or orifices. The aorta was markedly atheromatous. Upon the convexity of its transverse portion was a globular aneurism, at least as large as the heart itself, well lined with clots, and communicating with the aorta by an orifice scarcely admitting two fingers. The great vessels were uninvolved, and were less atheromatous than

the aorta. The œsophagus and the trachea were patulous and not compressed by the tumor. The lumen of the left bronchus was slightly diminished from above downward and from before backward. There were evidences of anterior mediastinitis. The tumor had become adherent to and had caused considerable erosion of the adjacent bones and cartilages. The liver was congested, and on section presented a fatty appearance. There was a mild degree of perihepatitis. The spleen was of normal size; its capsule was a little thickened. The kidneys were diminished in size; the capsules stripped with difficulty, leaving a granular surface; there was some atrophy of the cortical substance. The brain presented no gross lesion, although in places there were points of ecchymosis upon the surface of the convolutions. The authors argue that as there was no single factor to which the rapidly fatal asphyxia could be ascribed, it must be assumed that this resulted from the sum of all the influences at work. These included the mediastinitis, the inflammatory process extending to the sheaths of the pneumogastric nerve and its recurrent branch, and the pressure, however slight, upon the adjacent structures.

SURGERY.

UNDER THE CHARGE OF

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CONTRIBUTION TO THE ETIOLOGY OF CYSTITIS.

IN an advance communication to the *Centralblatt für Chirurgie*, WREDEN gives the results of his experiments, which show that most inflammations of the bladder are caused by bacteria from the intestine, viz., the bacterium coli commune. The researches of Doyen, Clado, Hallé, Albarran, Roosing, Morelle, Denys, Schnitzler, and Krogius are thus confirmed.

This conclusion, and also the anatomical relation of the rectum to the bladder, led the author to conclude that the infection was not embolic, as Roosing thought, but a direct infection from the rectum. Such an infection, with different lesions of the epithelium of the rectum, seemed to him very probable, especially as in the male the rectum and bladder for a considerable distance lie close together, and have a rich lymphatic and vascular anastomosis.

Experiments confirming the author's suppositions were made as follows: In the rectum of rabbits hot water or croton oil was introduced, but more frequently the lesion of the epithelium of the bowel was caused mechanically.

For this purpose a platinum wire, which had a very short and flat hook at the end, to avoid perforation, was employed. The results obtained were as follows:

1. Lesions of the mucous membrane of the anus, even if repeatedly made, have no influence on the bladder.

2. Every lesion of the epithelium of the rectum at the border of the prostate and higher up, is followed by cystitis.

3. The character of the cystitis and its course depends entirely upon the degree of lesion of the mucous membrane of the rectum and the character of the medium that has caused the inflammation.

4. In cases of experimental cystitis there were found in the urine bacteria found in the intestine of the rabbit, or those bacteria which had been introduced into the rectum.

The experiments were made exclusively on male animals for the reasons given.

Sphincterplasty.

Gersung describes in the *Centralblatt für Chirurgie*, 1893, No. 26, two cases in which the function of the sphincter was restored after resection of the rectum. The unfortunate condition of a patient upon whom it has been necessary to establish an artificial anus is so well known as to make repetition unnecessary. The various apparatus intended to control the contents of the bowel are unsatisfactory. If the feces are liquid or semi-liquid they fail entirely, while if the motions are fully formed the bowel is so fully relieved at each evacuation that apparatus has only a moral value. The success of the suggestion to use the abdominal or gluteal muscles in the formation of a new sphincter remains to be demonstrated.

The patients upon whom Gersung operated were suffering from carcinoma of the rectum. After resection of the diseased portion it was found possible to draw the bowel down to meet the skin incision. The author then rotated the rectum on its long axis by catching, with a pair of forceps on either side, until the index-finger could be introduced only with some difficulty. The bowel was then stitched to the skin incision. Healing followed rapidly and perfectly. In the first case continence was complete. The second patient had some incontinence of liquid matter at first, but this was rapidly overcome. Digital examination before the patients left the hospital showed that the funnel-shaped contraction, caused by the twisting of the bowel, had changed to an annular constriction, giving about the same resistance as the normal sphincter.

A New Method of Amputation through the Leg: Subperiosteal Amputation.

The frequent occurrence of gangrene in the flaps after amputations through the leg led Brun's (*Brun's Beiträge zur klinische Chirugie*, Bd. x.) to adopt the following method: A single circular incision is made, and the periosteum and the overlying soft parts separated from the bones, which are then sawn through. If needed, to give better access to the depths of the wound, two lateral longitudinal incisions may be made.

In twenty-two cases this method has proved very satisfactory; there was no instance of sloughing of the flaps, and the shape of the stump was excellent.

On the Admissibility of Ligation of the Femoral Vein.

Trzebicky and St. Karpinski (*Archiv für klin. Chirurgie*, 1893, Bd. xlv. Heft 3), in repeating the experiments of Braun, found that in injecting the popliteal or smaller saphenous vein of cadavers, after ligating the femoral vein in eighteen of thirty-one cases, the injection-mass reached the veins of the abdomen, principally through the obturator vessels.

By making the injections in the iliac or femoral artery the results were better. Vertical suspension and oblique elevation of the extremity favored the venous discharge, but made the arterial flow more difficult. For this reason the authors advise, in practice, elevation of the limb, only in those cases in which the activity of the heart is not in the least diminished. Massage had no visible influence in these experiments. The authors conclude that ligature of the femoral vein is justified when tamponage or lateral ligature would not suffice.

Retention of Urine following Operations.

Guépin (*Gaz. des Hôpitaux*, 1893, No. 33) calls attention to the brief mention of this complication in the text-books, although it is of very frequent occurrence. It occurs at all ages after puberty, but, according to the author, never happens in children under fifteen years of age. There are two clearly defined clinical forms, an indolent and a painful. The first occurs in those having healthy urinary organs, and the latter in patients with diseased organs. The duration of the retention is very variable. The indolent form usually disappears after the use of the catheter; the painful form may last several days.

In explanation of retention of urine, many causes are mentioned, *e. g.*, swelling of the urethra, the dressing, the pain of the wound, paresis of the abdominal muscles, narcotics, etc.

Guépin gives the three following factors:

a. Spasm of the urethra, particularly of the bulbous portion.

b. Paralysis of the bladder.

c. Abnormal position of the patient, *e. g.*, enforced dorsal decubitus, in which position many persons cannot urinate at all. In the treatment, the upright position should be assumed; this failing, a hot enema may be administered. If this is unsuccessful, a catheter should be employed, a soft one being preferable.

Contribution to the Anatomical and Clinical Knowledge of Cysts of the Long Bones.

Schlange (*Centralblatt für Chirurgie*, 1892, No. 30) reports five cases of this rare affection. In three instances the thigh was affected. About the seat of the affection a swelling was noted, due to fibro-cartilage or connective tissue overgrowth; in one case numerous giant cells were present. These, beyond question, result from the softening of tumors. The usual seat is in

the marrow of the bone near the end of the diaphysis. In these cysts, in common with echinococcus cysts of bone, fracture is frequently the initial symptom. Preceding the fracture the bone may undergo a slow bending, or the bending may occur without fracture. The author recommends complete extirpation of the cyst as the best method of treatment. When the tibia is affected a tumor-like focus is not apparent, nevertheless Schlange believes, in opposition to his former teaching, that the cysts result from softening.

Intubation.

Pitts, in a recent lecture (*British Medical Journal*, 1893, No. 1699) makes the following observations concerning the relative value of intubation and tracheotomy:

1. *The nature of the case.* Cases of a very malignant type, particularly those which arise in the course of scarlet fever or measles, are unsuitable for intubation, chiefly from the great tendency of the larynx to become ulcerated by pressure of the tube. In all cases where membrane is very extensive in the mouth, and there is a suspicion of extension below the larynx, early tracheotomy would seem advisable.

2. *The surrounding conditions.* Several of the American writers advocate intubation for cases in private practice, particularly amongst the poor, and when good nursing is not to be had, on the ground that, the intubation-tube once introduced, the child is in comparative safety; and if the tube gets blocked with membrane, it will probably be coughed out, and there will be a reasonable interval before dyspnœa recurs, sufficient to allow the medical attendant to arrive. Unfortunately, as we have seen by Dr. Turner's experience, there are exceptions; and we should be unwilling to intubate in private unless a medical man was living in the house competent to deal with any emergency. It is most unsatisfactory to have to do tracheotomy with unsuitable surroundings, but any intelligent person can be given instructions what to do if the tube gets blocked.

3. *The age of the patient.* Tracheotomy under two years is so very fatal that intubation would seem to offer the better chance if the larynx only is affected. In the Great Ormond Street cases three of the children were under eighteen months old, and yet two recovered.

4. *The previous experience of the surgeon.* It is most important that he should have thought carefully over the whole method of intubation, have previously practised it on the dead subject, and, better still, have had an extended experience on the living.

5. *The consent of the friends.* Consent might be obtained, when permission to perform tracheotomy had been refused, or if permission had not been asked, it would be right to give the preference to intubation.

Dr. Collier's experience has led him to the conclusion that intubation of the larynx is not a suitable procedure when laryngeal diphtheria is accompanied by diphtheria of pharynx, or of naso-pharynx, because:

1. The air thus supplied by the lungs, passing over the diseased surfaces, is impure, often foul, and, if not producing diphtheritic bronchitis, may produce broncho-pneumonia of the type of "cut-throat lung."

2. The obstruction is often not only laryngeal, but supra-laryngeal also.

3. The local treatment of the nose and pharynx is very difficult, owing to choking.

4. It is in this class of cases that the feeding of a laryngeal intubation case is so difficult.

Intubation of the larynx is also contra-indicated when one believes that there is membrane in the trachea.

1. Here apparently easy breathing usually results for a time; but while inspiration is relieved, the membrane acts like a valve over the end of the tube during expiration, and in this way extraordinarily rapid acute insufflation of lung is likely to occur. We have seen a chest become, in the course of eight hours, extremely barrel-shaped, with cardiac dulness quite hidden.

2. The expelling of membrane is extremely difficult, and usually attended by ejection of the tube.

On the other hand, Dr. Collier advises intubation in all cases of primary laryngeal diphtheria unaccompanied by supra-laryngeal obstruction, and without evidence of the existence of membrane in the trachea; in all such cases, indeed, as were until recently called "membranous croup."

A New Method of Direct Fixation of the Fragments in Compound and Ununited Fractures.

Senn, impressed with the defects of previous methods of securing and retaining accurate apposition in cases of compound and ununited fractures, advocates (*Annals of Surgery*, 1893, vol. xviii., No. 2) the employment of hollow perforated intra-osseous splints or of bone ferrules. The author objects to the wire suture, because it frequently fails to maintain apposition, because he believes that in some cases the wire induces necrosis of the bone, and because a foreign body is thus permanently retained at the seat of fracture. Metallic spikes and screws are dismissed with the mere mention of the method. Ivory cylinders and clamps have proved successful in practice, but the ivory is less rapidly absorbed than bone, and in addition the presence of a solid cylinder in the medullary cavity is an objection. The hollow perforated intra-osseous bone-splint is equally efficient in securing fixation, and in addition the lumen soon becomes filled with valuable bone-producing material, and the new bloodvessels may reach the point of fracture through the numerous perforations.

It is recommended to make these cylinders of the shafts of the long bones of chickens, turkeys, or rabbits. The medullary cavity is to be increased in size by the use of a small round file, and the perforations made with a drill. The length of these splints should vary from one to three inches.

In cases of very oblique fracture the bone cylinder will not retain the fragments securely. For these cases Senn recommends the use of the bone ferrule. For the humerus and femur of the adult the ferrule should be prepared from the femur of the ox; for children the same bone of a smaller animal should be selected. For the tibia the corresponding bone of the ox is selected on account of the similarity in shape. It is recommended to make the sections of bone with a sharp saw, from one-quarter of an inch to an inch in width as desired. The medullary cavity is enlarged by means of a

round file, until the thickness of bone does not exceed one-sixth of an inch. Wide ferrules should be perforated.

The cylinders and ferrules are sterilized by boiling and subsequent immersion in sublimate alcohol 1 : 1000, until ready for use. The ferrule must be large enough to pass easily over the bone, otherwise it is apt to be broken. The ferrule is first slipped over the most accessible fragment, and after reduction is accomplished is passed along so as to engage the second fragment. At this point great care is needed to avoid bending the bone at the seat of fracture, which might break the ring.

In the use of the cylinder or ferrule a plaster-of-Paris dressing is to be applied to the limb to maintain immobility. A fenestra may be made at the seat of the wound to permit of dressing.

The following conclusions are added:

1. Direct fixation of the fragments is indicated in all compound fractures in which perfect retention cannot be secured by simpler measures, and in the treatment of ununited fractures requiring operative interference.

2. This method is also justifiable in the treatment of certain forms of subcutaneous fractures in which reduction and retention cannot be accomplished without it.

3. Free exposure of the fragments in compound fractures secures the most favorable condition for thorough disinfection.

4. Perfect reduction and direct fixation of the fragments, are the most reliable prophylactic measures against delayed union, non-union and deformity.

5. A compound fracture should be regarded in the same light as an injury of the soft tissues, and should be treated upon the same principles, viz., accurate coaptation of the different anatomical structures, and perfect retention by direct means of fixation, aided by an efficient external support.

6. Bone suture, metallic, bone and ivory nails do not furnish the necessary degree of support and immobilizatin in the direct treatment of fractures characterized by a strong tendency to displacement.

7. The solid intra-osseous splint of ivory or bone as advised by Heine, Langenbeck, and Bircher, is objectionable, because it interferes with the ideal production of the intermediate callus, and its spontaneous removal is beyond the absorptive capacity of the tissues.

8. The hollow, perforated ivory or bone cylinder, devised by the author, answers the same mechanical purpose without the objections which have been charged against the solid cylinder.

9. The safest and most efficient means of direct fixation of oblique fractures is by a bone ferrule, which must be applied in such a manner that it surrounds both fragments.

10. Such a circular absorbable direct splint prevents to perfection lateral and longitudinal displacement.

11. Rotation of the limb below, and angularity at the seat of fracture, must be prevented by a carefully applied circular plaster-of-Paris splint.

12. For fractures not requiring drainage, the entire wound should be closed by buried and superficial sutures, as the bone ferrule is removed by absorption.

13. In suppurating wounds the bone ferrule should not be removed until direct fixation has become superfluous by the formation of a sufficiently firm union between the fragments.

14. The external splint should be applied in such a manner that it does not require a change throughout the entire treatment, permitting at the same time access to the wound, should this become necessary.

15. Direct fixation of a fracture, combined with perfect immobilization, brings the different anatomical structures of the broken bone permanently into their former normal relations, preparing the way for the early initiation and speedy consummation of an ideal process of repair and the realization of a perfect functional result.

16. Should future experience demonstrate that bone is not sufficiently absorbable, the same kind of ferrules can be made of partially decalcified bone or chromicized catgut.

Injuries to the Epiphyses and their Results.

In an interesting lecture delivered at the Royal College of Surgeons, Jonathan Hutchinson, Jr. (*British Medical Journal*, 1893, No. 1697), calls attention to the fact that injuries to the epiphyses is more frequent than is usually taught. He bases his observation on 350 cases, nearly 150 of which have not been published before. These injuries are of especial importance, because of the difficulty in diagnosis and the danger of arrest of development in the injured bone. The latter result is most prejudicial when one of the bones of the forearm or leg is affected. The author has shown by experiments on rabbits that the epiphysial disk has a remarkable vitality, and that when the epiphysis is accurately replaced, after being separated, the natural development of the limb usually follows. It is important to effect reduction as early as possible, because: 1. The rapid occurrence of swelling will make the diagnosis and correction of the exact displacement more difficult. 2. The connecting bridge of periosteum quickly thickens and shortens; from this cause, at the post-mortem of a rabbit, whose lower femoral epiphysis had been detached and allowed to remain displaced, it was found quite impossible by any reasonable force to effect reduction, although only eight days had elapsed since the injury. 3. The more prompt the replacement the less will be the risk of exuberant callus, of interference with growth, and possibly also of suppuration and necrosis.

The author refers to three "undoubted cases" of separation of the sternal end of the clavicle in patients aged twenty, fourteen, and seventeen years respectively. At about the twenty-fifth year the epiphysis becomes fused with the shaft.

In most cases of detachment of the upper epiphysis of the humerus the shoulder-joint is said not to be opened, particularly if the patient is under the age of twenty. The author says: "It is sufficiently accurate and a point of practical importance to say that separation of this epiphysis before the age of about twenty takes the place of dislocation of the shoulder-joint. How much trouble in treatment and discredit to the practitioner might have been saved if this fact were generally admitted. Time after time the doctor called to a case of separation of this epiphysis has pronounced it to be one of dislocation, has employed various methods of reduction, and has been mortified by the tendency to recurrence and the very indifferent result obtained."

In analyzing the records of 26 cases of this injury, 13 of which were ob-

served personally, in 6 instances the accident was found to have occurred at birth, and in 4 during the first year of life. Omitting these, the average age at which the detachment occurred was thirteen years; in 17 cases the patient was fifteen years of age or above. The following are given as the chief points in the diagnosis of separation of this epiphysis:

1. The age of the patient—under about twenty years.
2. The arm is comparatively helpless, the elbow often directed a little outward or backward.
3. Abnormal mobility just below the shoulder-joint, best made out by abducting the humerus.
4. Rapid swelling about the shoulder, some shortening if the diaphysis is wholly displaced.
5. Muffled crepitus on replacement.

Reduction is best accomplished by steady traction on the arm, slight abduction, aided by rotary movement, or by direct pressure. If the diaphysis protrudes just under the skin, and prolonged efforts at reduction fail, the end of the diaphysis should be exposed (with every precaution to asepsis), the opening in the periosteal sheath enlarged, or the rent in the other soft tissues held open, and the bone returned to its place. This has been done with success, even at the interval of several weeks from the accident; but it is then usually necessary to resect part of the diaphysis.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF

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Massage in the Nose and Throat.

Dr. W. Freudenthal, of New York, comes (*Medical Record*, 1893, No. 1185) to the support of Braun, Laker, and others in emphasizing the beneficial results of massage upon the circulation, both lymphatic and venous, in the mucous membrane of the nose and throat in the treatment of various diseased conditions. The necessary manipulations, which ordinarily require such a great deal of practice as to limit their acquisition to the few who are willing to go to the trouble of learning them, are now rendered easy by an electrically controlled vibrator devised by Dr. Freudenthal, and illustrated in his paper. The statements of Braun, Laker, and some others abroad, and now those of Freudenthal at home, are so positive for good that it is to be hoped similar good will follow in the hands of others who may be disposed to pursue the treatment now that its technique has become so much simplified by Dr. Freudenthal's electro-motor.

Nasal Reflexes in Chloroformic Syncope.

In a recent discussion before the Académie de Médecine (*Le Progrès Médical*, 1893, No. 28), M. Guérin contended that irritation of the pituitary membrane at the commencement of the anæsthesia could provoke mortal syncope by reflex action. This view was confirmed by some experiments upon a tracheotomized rabbit before the Academy. An instrument for recording the cardiac movements being placed upon the thorax of the animal, it was seen that no change took place while the anæsthesia was given through the canula, while those movements became feeble, slow, and irregular when the chloroform was administered through the nose. M. Fort recorded a case of death due to sudden nasal inspiration of the vapor during the anæsthetization. The inference left is that the nose should be compressed and the anæsthetic be administered through the mouth at the commencement of the anæsthetization.

The Influences of Nasal Disorders upon the Digestive Tube.

Quite an elaborate paper upon this subject appeared in *Le Progrès Médical*, 1893, No. 28, from the pen of Dr. Félix Chabory, of Mont-Doré. Commencing with the lips, attention is called to the herpes preceding the conclusion of an acute coryza; to various forms of eczema due to discharges from the nose; to œdema from furuncula and other diseases of the nose; to rhinoscleroma, tuberculosis, and lupus in extension from the same diseases in the nose; and to the thickened upper lip in some cases of adenoid growths. Then follow considerations on concomitant diseases of the palate, jaws, teeth, tongue, salivary glands, tonsils, uvula, pharynx, œsophagus, stomach, and intestines, including hernia as a result of abdominal pressure in violent or prolonged efforts of disembarrassment from secretions pent up in obstructed nasal passages.

An excellent article for the scrap-book of the rhinologist.

The Bactericidic Power of the Nasal Mucus.

Messrs. R. Wurtz and M. Lermoyez report (*Annales des Mal. de l'Oreille*, etc., 1893, No. 8) some experiments which support the theory that nasal mucus is inimical to bacteria and protective from them, and they intimate that it is to this property of the nasal mucus that the ordinary immunity from injury after intra-nasal operations must be attributed. [The compiler believes that Dr. Seiler, of Philadelphia, has long maintained this opinion of the antiseptic character of nasal mucus.]

Anæsthetics for Operations in the Nose and Throat.

Mr. Lennox Browne, of London, pleads (*Medical Press*, 1893, No. 2831) for the use of nitrous oxide gas in all cases where the operation consumes but few minutes. He particularly urges this gas in the removal or evulsion of lymphoid growths at the vault of the pharynx—adenoids—the time required for which does not exceed forty-five to sixty seconds. If ninety to one hundred seconds be required, the narcosis may be prolonged by supplementing ether vapor during the last few respirations.

Mr. Browne also prefers local anæsthesia for tracheotomies by means of hypodermatic injections of cocaine solution each side of the line of the incision—a practice usual with the present compiler since cocaine has been so used. Before the introduction of cocaine, the compiler for many years, more than twenty perhaps, always used local anæsthesia, at first produced with the topical use of ice and salt, and subsequently by refrigeration with sprays of sulphuric ether of low specific gravity, and later with sprays of rhigolene.

Scleroma of the Upper Air-passages and Blennorrhœa.

Prof. Chr. Lemcke, of Rostock, contends (*Deut. med. Wochenschr.*, 1893, No. 26) that the so-called Stoerck's blennorrhœa, or chronic blennorrhœa of the upper air-passages, is identical with the rhinoscleroma of Hebra and its congeneric manifestations, which, with Bornhaupt, he prefers to call scleroma respiratorium. His argument is enforced by the recital of two cases which are illustrated, and by the microscopic examination of the secretions which, with cultures from them, revealed the pathognomonic encapsuled bacilli peculiar to scleroma.

Œdema of the Larynx in Influenza.

Dr. Marcel Natier reports (*Annales de la Polyclinique de Paris*, 1893, No. 7) three cases of œdema of the larynx during attacks of influenza in his own practice, and reproduces two from Cartaz's practice:

I. In a butcher, twenty-five years of age, the left vocal band was greatly œdematous and covered with a delicate membrane almost transparent. The œdema was equally distributed, and the deformed band resembled an everted ventricle. The subsidence of the œdema consumed more than a month.

II. In a laundress, forty-eight years of age, the œdema likewise involved the left vocal band. Subsidence in this case consumed several weeks, and had not been completed when the paper was written; a reddish cyst seemed to have been produced in the centre of the vocal band.

III. Again, in a third case, a worker in bronze, twenty-nine years of age, the œdema occupied the left vocal band.

IV. In one of Cartaz's patients, a groom, the œdema similarly occupied the left vocal band, but subsided much more rapidly than in Natier's cases, having disappeared completely on the third day, although so intense during one twenty-four hours as to have made tracheotomy almost necessary.

V. In a syphilitic woman, thirty years of age, Cartaz noted œdema over the left arytenoid region to the bulk of a small nut (hickory-nut?), resolution of which occurred on the third day.

Leeching and ice-compresses were used in Cartaz's cases; zinc chloride, topically and by inhalation, in Natier's cases.

Total Extirpation of the Larynx without Preliminary Tracheotomy.

Dr. Ch. Perier reports (*Bull. de l'Académie de Méd.*, July 24, 1893) this case. In January, 1891, a man sixty-two years of age noted the first symp-

toms of what eventually proved to be an epithelioma of the larynx. The operation was performed June 12, 1893, under chloroform anæsthesia as follows: Two transverse incisions from one sterno-mastoid muscle to the other, one immediately below the hyoid bone, and the other a finger's breadth below the cricoid cartilage; a median vertical incision uniting the two others; dissection of the two flaps right and left, scraping scrupulously the external surface of the larynx and trachea; hæmostasis; transfixion of the trachea on each side with a loop of thread to retain control of it after section; insinuation of a grooved director behind the trachea, between its uppermost cartilage and the commencement of the œsophagus. The trachea was then severed with one cut of the bistoury, guided upon the grooved director, and was then immediately drawn upward and forward with the two loops of thread that had been inserted into its walls. A conical canula was then inserted into the trachea. This canula has a projection, around which the threads were immediately secured. Anæsthetization was then continued through the canula and a large rubber tube extending some distance from the body.

The larynx was then removed from below upward, a portion of the uninvolved epiglottis being retained. The mucous membrane of the pharynx was sutured to the upper transverse incision, and the trachea was sutured to the lower one, the canula being permanently removed. Recovery was prompt; the sutures were removed on the eighth day, and at the time of report some satisfactory results had been accomplished with a special form of artificial larynx, the supply of air for which was furnished from without the body by means of a double-bulbed reservoir as for the atomizer.

OBSTETRICS.

UNDER THE CHARGE OF

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ASSISTED BY

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PUERPERAL ECLAMPSIA.

GREEN (*American Journal of Obstetrics*, 1893, No. 1) records the experience of the past eight years in the Boston Lying-in Hospital.

Puerperal eclampsia is believed to occur once in about five hundred pregnancies, and as this hospital cares for about five hundred house patients yearly, eight cases of eclampsia would be its due proportion in the period covered by the report given; that during this time the hospital has received

thirty-six cases, an average of four and a half each year, is due to the fact that eclamptics are often sent to the hospital, who, but for this complication, would be attended in their own homes. In the treatment of ante-partum eclampsia, especially where the attack occurs before the fœtus is viable, the aim of the obstetrician of course is to restore the function of the kidneys without interrupting the pregnancy. The methods adopted in the treatment of ante-partum eclampsia are as follows: Ether is used to control the convulsions. chloral hydrate by the rectum as a nerve sedative between the attacks; morphine is never used. To excite action of the skin, the patient is placed in a hot-air bath, or in mild cases the use about the patient of heated plates rolled in blankets; for drugs, pilocarpine guarded by brandy and other stimulants to avoid depression. Unless the skin responds promptly and in a satisfactory manner, the eliminative action of the bowels is invoked with elaterium or croton oil, aided if necessary, by enema. Digitalis and nitroglycerin are used for their effect on the circulation.

A summary of the results of the writer's success are as follows: In a total of three cases in which the fœtus was non-viable and in which there was no obstetric interference, the maternal mortality was 0 per cent.; fœtal, 33 per cent. In a total of six non-viable cases in which labor was induced, the maternal mortality was 50 per cent., the fœtal of course 100 per cent.

When the eclamptic has reached the period of fœtal viability, there is much less incentive to delay obstetric interference. In the following group of four primiparæ delivery was indicated in the interests of mother and child. In this group 75 per cent. of the maternal cases had a fatal termination, fœtal mortality 50 per cent.

When the eclamptic seizure occurs during labor, it has been the practice of the hospital to deliver as soon as the visiting physician could be summoned. It is not believed that the shock of operative interference under anæsthesia unfavorably affects the nervous system, but on the contrary, that the kidney more quickly recovers its functions after the uterus is emptied. Of inter-partum eclampsia, eight cases are recorded, of these 25 per cent. of the mothers and 25 per cent. of the children died. When the seizure first appears post-partum, the question of obstetric interference naturally does not arise. It may be thought by some that in the presence of symptoms during labor threatening a convulsive seizure it is well to terminate the labor artificially. While such a course is doubtless advisable in lingering labors, it has been the custom of the institution not to interfere when labor is progressing normally. Nervous symptoms are allayed and the kidneys mildly stimulated. Fifteen post-partum cases are recorded, two being twin labors, maternal mortality $6\frac{2}{3}$ per cent., fœtal 12 per cent. Of the latter one died from cerebral hemorrhage on the third day, two were non-viable.

It is thought by the author that post-partum hemorrhage occurs in many eclamptics. Where not severe he has not checked it, as it relieved the blood tension and is favorable to the patient's recovery. Out of the whole thirty-six recorded, twenty-seven mothers were discharged well, nine died, total mortality 25 per cent.

The relation to maternal results of the number of convulsions in any given cases is as follows: The twenty-seven mothers who recovered had from one to twenty-five convulsions respectively; and the nine who died, from two to

twenty-four; or, by averages, those who recovered had five and three-tenths convulsions, and the fatal cases ten and eight-tenths, or more than twice as many. The prognosis, however, in any case, appears to depend more upon the time when the convulsions occur, upon their severity and frequency, upon the length of the labor, the depth of the coma and the degree of kidney insufficiency, than upon the number of convulsions.

Cæsarean Section for Osteomalacia complicated by Placenta Prævia.

Lodemann (*Centralblatt für Gynäkologie*, 1893, No. 24) reports the following case: A V-para, thirty-nine years old, one abortion, distinct history of osteomalacia; being for one year unable to walk. By internal examination the outlet was found so contracted that two fingers laid together could not be withdrawn. Other striking deformities existed. The pubes had the typical beak form. Six days after admission pains began, accompanied by some hemorrhage, which persisted several days, finally becoming so severe that the patient became pulseless. The bleeding was finally controlled by tampons.

When examined before operation, the lower borders of the ribs were found to rest upon the iliac crests. The uterus was drawn tightly about the fœtus and reached three fingers' breadth above the umbilicus. Cæsarean section was performed with the help of one assistant. Disinfection accomplished on the external parts with 1 : 1000 sublimate solution, lysol 1 per cent. in the vagina. The uterus being incised longitudinally the fœtus was extracted without difficulty. Hemorrhage was slight. Placenta was found attached in the inferior segment of the uterus and on the posterior wall. The uterine cavity was filled with iodoform gauze and the organ closed over the same by two hands pressed upon it, eight catgut sutures being inserted to secure exact coaptation of the wound borders. Gauze was then withdrawn.

The infant was poorly formed and was dead when born. The puerperal period was favorable; the temperature rising only once; at the same time some odor being noticed in the lochia, an examination was made and a tampon was found to have been left in the vagina. Lysol was used as an antiseptic. Patient recovered. No antiseptic fluids were used in the abdominal cavity, the operation being done on the "dry" antiseptic principle.

A Case of Spontaneous Rupture of the Symphysis during Delivery.

Oehlschlager (*Centralblatt für Gynäkologie*, 1893, No. 24) gives an interesting account of a twenty-years old I-para who came under his care suffering from eclampsia. Albumin was found in the urine, and some œdema was present. Patient had within one year shown symptoms of rhachitis. Forceps being applied to the head high in the pelvis, a somewhat strong traction was made. During the delivery the symphysis ruptured with a distinct sound, and immediately showed a separation of perhaps 3 cm. After this the delivery was easy, and a living child was extracted. The eclampsia did not return. A strong bandage of leather was put around the patient's hips. No fever appeared, and in three weeks she was discharged. When last seen the

two ends of the symphysis were about 1 cm. apart, but this did not interfere with the movements of the woman. The author knows of no similar case either in his own practice nor that of other physicians.

Symphysiotomy.

Bidder (*Centralblatt für Gynäkologie*, 1893, No. 24) reports a case of the above operation done by him in the St. Petersburg Maternity. The patient was eighteen years old, and bore distinct evidences of rhachitis. Diam. trans. 28, diam. cr. 26, sp. 25, cong. ext. 19, cong. diag. 9½–9½, cong. vera 7¼–7½, promontory double. She also had a purulent discharge from the genital organs. Temperature 38.3° C. The child was presenting in the first vertex position and presentation. Section of the pubic joint presented no great difficulty. Some bleeding in the deepest part of the wound was encountered, but was easily controlled by iodoform gauze. The joint after section separated 1–1½ cm., which increased to 5.5 cm. during extraction of head by forceps. The infant did well notwithstanding a slight degree of asphyxia caused by the cord being around the neck. The left labium near the clitoris contained a broad tear which was repaired by silk stitches. A single binder was used around the hips. Endometritis and a stitch abscess delayed the recovery somewhat, but on the twentieth day an investigation of the symphysis could be made. It was found that the surface contained a furrow, and the two ends of the bones were not entirely united; however, the motion was unimportant, and two weeks later the patient was discharged. The author has a very favorable opinion of the operation.

Pinard (*ibid.*) reported 19 symphysiotomies done by himself and his pupils. All the mothers completely recovered; 16 children lived; 3 died, not, however, directly from the operation. In 10 cases where he had applied the forceps according to the old indications only 1 child lived. To the above 19 operations were added 1 ischio-pubiotomy in an obliquely contracted pelvis, and 1 Porro's operation: result from the whole number, 21 women recovered and 18 children. Sixteen of these women had previously had 30 pregnancies, from which only 2 children lived.

Forchier (*ibid.*) operated on a case of generally narrowed pelvis with a conjugate of 11 cm., with a happy result for both mother and child. The writer gives a warning against the indiscriminate use of this operation; the difficulties and dangers should be justly considered. Where infection is to be feared symphysiotomy is completely contra-indicated; yet within necessary limits, he repeats, the operation has a good future.

Gueniot (*ibid.*) had operated on three cases. The first he had already reported. In the second case he had a rhachitic pelvis of 8.5 cm.; in the third a generally contracted pelvis of 9 cm. Both cases did well as far as the mother was concerned; one child died.

Budin (*ibid.*) operated in a case of rhachitic pelvis with a conjugate of 9 cm. The child was in danger. During the operation there was considerable bleeding, which was controlled by compression. The extraction of the child was easily accomplished, but it died in ten days. The woman made a good recovery.

In a case reported by Mayguir symphysiotomy was done for dystocia

caused by a periosteal tumor on the left side of the symphysis. Cæsarean section could not be done, and basiotripsy was rendered very difficult by the great narrowing of the pelvis. After separation of the symphysis 6 cm. would make allowable an investigation with forceps. After prolapse of the cord and one hand embryotomy was performed. The anterior vaginal wall was torn 5 cm. in the operation. Patient did well, except for a phlegmasia, until the second day, when she was suddenly was attacked with dyspnœa, and died in ten minutes from blood-clot in the right pulmonary artery. Upon investigation it was found that the symphysis was nowhere united, but the ends of the joint were 2½ cm. from each other.

TEDLIER reported a case with unfortunate termination. The patient was a I-para, twenty-seven years old, with regularly contracted pelvis. Diag. conj. 10¾ cm. Symphysiotomy gave a separation of the joint of 5 cm. which increased to 8 cm. during the forceps delivery. Through tearing of the inferior border of the wound considerable hemorrhage was encountered. The perineum, bladder, and urethra were torn. The mother died two hours after delivery from weakness; child lived. He considers symphysiotomy decidedly an operation without harm and for the common good, and that it will supplant craniotomy.

LEPAGE (*Centralblatt für Gynäkologie*, 1893, No. 20) reported the case of a II-para operated on for dystocia caused by a round tumor on the left side of the pelvis. After the operation the delivery was easily accomplished. Silver wire was used to suture the symphysis. Recovery good.

QUENEL cited a case of a V-para of twenty-five years delivered for eclampsia at seven months. Breech presentation. Symphysiotomy was done, and the child delivered, dead, by forceps. Cong. diag. 11 cm.; diam. Baud. 18. The writer believes that in a separation of 2 cm. the forceps can conveniently be applied. In the above case silk was used to suture the pubic joint. The woman recovered. He considers symphysiotomy without danger to the mother.

BRAUN (*Centralblatt für Gynäkologie*, 1893, No. 26) reports an operation on a woman whose pelvic measurements were: sp. 22 cm., cr. 24, tr. 27, cong. ext. 15½, circumference 69, cong. diam. 9½. Child was in an oblique position, the upper extremity and umbilical cord near the os uteri. The conjugata vera was scarcely 7¾ cm. The joint after section separated 5 cm. Forceps was applied, and the child extracted without any tearing of the perineum. Silver wire was used to secure the bones. Patient was discharged on the thirteenth day.

A woman, twenty-eight years old, a III-para; all previous children had died during or shortly after birth. The child was presenting by the shoulder with the left hand prolapsed. Uterine tetanus was present. A version was done under chloroform, and was followed by symphysiotomy and extraction. The pelvic measurements were: sp. 24 cm., cr. 28, tr. 31, B. 17½, c.d. 10, cr. 8½. Some injury to the sacro-iliac joint was done. The infant was somewhat asphyxiated when born, but was resuscitated easily. Silver wire was used to suture the symphysis. Six silk sutures and eight stitches were inserted to close the fissure and skin. On the tenth day it was found that the silver wire had been imbedded in the callus. During the puerperium an attack of bronchitis set in accompanied by retention of urine.

The injury to the sacro-iliac joint gave the patient pain, but she recovered without further complications.

The author does not believe the operation should be performed where an endometritis has existed previously to the birth, the danger of septic infection and of abscess, particularly where wounding of the sacro-iliac joint exists, being greatly increased by the discharge. In these cases craniotomy, Cæsarean section, or Porro's operation retain their old place.

WERTHEIM reported the case of a IV-para, twenty-six years old. The head presented. Pelvic measurements were: cr. 8 cm., the transverse diameter much shortened, sp. 23, cr. 25, tr. 28. After section the joint separated 6½ cm. The head was easily extracted by means of Breus' axis-traction forceps. No wounding of the soft parts took place. There was considerable odor to the liquor amnii. This patient died of sepsis on the eleventh day. Section showed an endometritis and thrombo-phlebitis of the right ovarian vein. Death was due to septic infection previous to the operation.

HEMORRHAGIC DIATHESIS OF THE NEWBORN.

SCHAEFFER (*Centralblatt für Gynäkologie*, 1893, No. 22) reports two cases as follows:

The first child died in twenty-eight hours. Post-mortem revealed bacteria, staphylococcus aureus and pyocyaneus, in the spleen, liver, and small intestines, also in the peritoneal and pleural effusions. By cultures the same bacteria were produced. It was supposed that their origin was in a large suppurating (syphilitic) abscess in the uterus.

In the second case a child fed on cow's milk died at the end of three days of typical melæna. An ulcer was found in the duodenum, from which, and also from the spleen, cultures of the bacillus lactis aërogenes were obtained.

HYPERTROPHY OF THE MAMMARY GLANDS.

SCHAEFFER (*Centralblatt für Gynäkologie*, 1893, No. 22) reports a case of hypertrophied mammæ in a girl fourteen years old. Amputation was performed. The right breast was found to weigh 3900 gm., the left 3500 gm. The hypertrophy was due to fibrous increase of the gland lobes.

THE PROPHYLAXIS OF BLENNORRHŒA NEONATORUM.

VON ERDBERG, in his inaugural address at Dorpat (*Centralblatt für Gynäkologie*, 1893, No. 24), considers the subject of the various prophylactics against blennorrhœa of the newborn. He is of the same opinion as Von Brunner, that only those cases can be counted blennorrhœal in which the Neisser's gonococcus is found, an opinion which has been attacked lately by different authors. Infection at birth he considers of rare occurrence, and intra-vaginal infection cannot be found. The average time of incubation of the disease was, in his cases, from two to five days, while later appearance of the attack was due to late infection. Notwithstanding the great success of the Credé method and in contrast to many authors, the writer holds that patients coming with symptoms of hyperæmia, swelling

and roughness of the palpebral conjunctiva, in which a sero-purulent secretion is found, present many difficulties in diagnosis to the ophthalmic surgeon. Silver nitrate he does not consider a specific against the disease; it is possible with it to set up an acute traumatic affection. The best fluid for instillation is a sublimate solution of the strength of 1 : 5000; it produces scarcely any reaction. Fully 75 per cent. of children born need no solution of any kind in their eyes. When the vagina previous to birth has been thoroughly disinfected, distilled water is all that is necessary to drop into the eyes. It might be well, as soon as the head is born, and before the shoulders appear, to carefully cleanse the eyes with a sublimate solution 1 : 1000, or iodtrichloride 1 : 4000, using a piece of cotton, and taking care that the eyes are not opened. This method should always be resorted to whenever it has been proven that the mother has gonorrhœa. It has been proven by Oppenheimer that mercuric bichloride in the strength of 1 : 30,000 is fatal to the life of the gonococcus. The writer includes a number of interesting statistics showing the comparative results of the methods of Credé, Kaltenbach, Küstner, and others.

Chlorosis and Post-Partum Anæmia.

Schmidt (*Centralblatt für Gynäkologie*, 1893, No. 26) in a study of the effects of chlorosis on the female organism during the time of reproduction, relates the following interesting facts. Out of 148 women, 39 gave histories of chlorosis, more or less severe, during their younger years. Great care was taken to exclude all those with doubtful chlorotic histories. Of these 39 cases, the conditions at the time of childbirth were, as regarded health: 3 were in very good condition; 17 good; in 10 the health was sufficiently good for the needs of mother and child, and 9 were in poor state of health. In 30 of the above no traces of the former anæmia could be seen. Those belonging to the class represented by nurse maids, maid servants, etc., who by their mode of life are much in the fresh air and light, with bodily exercise, generally become strong and healthy wives; females of the class who, in the earning of their bread, are compelled to sit all day, later become women of a sad, dejected type.

With a single exception all the patients with early chlorosis could nurse their children.

In 37 cases recorded (three cases twins) the birth occurred spontaneously, once the forceps was applied, for weak pains; in this case there was considerble post-partum hemorrhage. Asphyxia occurred 3 times. No lowering of the contractile power of the uterus from the early chlorosis could be found, which is contrary to the opinion of Winckel. Of the above 39 cases, 41 children were born; twins occurring once, twice the children were macerated, the average weight of 27 of the children was 3277.4 gm. The writer concludes that early chlorosis does not of necessity influence the chances of a woman to have healthy children.

Société Obstétricale de France.

Wallick (*Répertoire Universal Obstét. et Gynécol.*, 1893, No. 4) considers anatomical rigidity of the uterine neck during labor to be due primarily to

a vice of the dilating agents, rather than a lesion, not demonstrated, of the parts about to be dilated. His histological examination in one case revealed secondary infiltration with bloody serum and œdema due to the compression of the neck and fœtal head. The muscular fibres were disassociated thereby, and could not act. The uterine neck broke circularly, and was expelled after twenty-four hours.

GUENOIT (*ibid.*) advises small incisions around the neck in these cases. He sometimes employs a special uterine dilator. He does not regard these incisions as dangerous, and as preferable to section, provided the child is dead. If it be alive use Cæsarean section.

CHAMBRELANT (*ibid.*) narrated some researches on the passage of pathogenic microbes through the placenta, using staphylococcus, streptococcus, and bacterium coli commune. The blood for the cultures was taken at times from the heart-cavities, at times from the kidney and from the nerve centres. From the maternal and from fœtal blood identical colonies were obtained. The three microbes traversed the placenta at all periods of gestation, and were found in all tissues of mother and embryo. The size of the bacillus seems to influence the passage through the placenta.

BOUFFE DE SAINT BLAISE (*ibid.*) describes what he believes to be the characteristic anatomical lesion of gravid auto-intoxication, viz., hemorrhagic centres spread in the tissues of the liver, particularly around the suspensory ligament. The microscopic lesions are identical in yellow and in white eclampsia, and consist of fatty degeneration of the hepatic cells around the portal veins and in capillary dilatations. There was also nephritis. He found the same conditions present in all the thirty-one post-mortems made by him.

POTOCKI discussed prophylactic drawing down of the anterior foot in incomplete breech presentations. At the Baudelocque clinic this had been practised thirty-three times. These cases are divided into three classes:

1. In 28 cases anterior foot was withdrawn; 28 living children.
2. In 4 cases posterior foot was withdrawn; 3 living children.
3. In 1 case the anterior foot was withdrawn before complete dilatation; the cord came too, and the child was extracted dead two hours later.

Of these 28 cases, 19 were primiparæ. In 11 of these the breech was at or above the superior strait; 6 times it was engaged a little, 11 entirely engaged, and twice the perineum was distended. The size of the infant affected the manœuvre.

Relative to the microbic origin of eclampsia, CHAMBRELANT stated that eclampsia seemed due to poisoning by a toxin, but the presence of a true pathogenic bacillus has not been demonstrated. So far all those discovered have been saprophytes or B. coli commune.

HERRGOTT, discussing gastro-intestinal hemorrhage in the newborn, found the cause to be variable: brevity of the cord, or ulcerations of the gastro-intestinal mucous membrane due to fatty degeneration of arterioles; to action of gastric juice or embolism of the arteries of the stomach; in some cases no cause could be found. These cases are rare, 1:1000. In one case the right heart was dilated to excess, and the left rigidly contracted.

BUDIN (*ibid.*) In 76 cases of rhachitic pelves with narrowing to 10 cm. at superior strait, there were 5 forceps, 2 versions, 1 embryotomy—70 living infants, all accouchements being spontaneous.

In 28 cases, pelves 5–10 cm., 3 forceps, 2 versions—26 living infants.

In 20 cases, pelves 8–9 cm., 15 accouchements spontaneous, 5 accouchements artificial, 12 forceps, 3 versions—19 living children.

Under 8 cm., 3 living children.

In cases of pelves generally contracted, 2 living children; 1 forceps, 1 version, 1 symphysiotomy.

Total *résumé:* 131 accouchements; maternal mortality 6 per cent.; infantile 8.3 per cent. All the dead infants save one were born spontaneously.

BORAK and BERNHEIM (*ibid.*) report five cases of eclampsia and one of uræmic dyspnœa treated successfully by injections of salt water.

OUL and SABRAZES report a case of post-partum eclampsia in the course of a broncho-pneumonia, nine days after labor. Death in coma in forty-eight hours. Sections of liver showed peri-portal hemorrhages and degeneration of liver cells. Cultures from blood of heart and lungs gave staphylococcus albus and bacterium coli commune.

SYMPHYSIOTOMY FOR CONTRACTED PELVIS. RECOVERY OF MOTHER AND CHILD.

BURNS and ATHERTON report (*Dominion Medical Monthly*, 1893, No. 1) what is presumed to be the first symphysiotomy in the Province of Ontario. The patient was a I-para in her thirty-fourth year, was below middle height, but without deformity. The pelvic measurements appeared by manual examination to be normal, except the conjugate, which was less than three inches. Labor being delayed, an attempt at forceps extraction was made, but proving unsuccessful symphysiotomy was decided on. Section of the pubic joint was accomplished by means of a hernia knife; the ends of the pubic bones separated about two inches during the extraction of the fœtal head, which had to be done with forceps. Some hemorrhage was encountered, but was easily controlled. The perineum was torn to the sphincter, and was at once united by catgut sutures, silkworm-gut being used to close the external wound. The woman, after a slight rise of temperature on the third evening, did well. The fœtal head was found to be large, anterior fontanelle nearly closed.

PURPURA OF THE NEWBORN.

GLENN (*Transactions of the Royal Academy of Medicine*) reports the case of a first child of healthy parents; no history of syphilis, child asphyxiated when born. At birth the infant was covered with discrete hemorrhagic spots, especially on the face, chest, and back. On auscultation a loud bruit was heard over tricuspid area. The child lived thirty-six hours. On post-mortem the spleen was found much enlarged and of a deep red color, weighing forty-five grammes. Liver enlarged, deeply stained with bile and firm to the touch. Kidneys, with the exception of a few superficial hemorrhages, were normal. Stomach and intestines were covered with purpuric spots similar to those on the skin. Both visceral and parietal layers of the pleura were studded with hemorrhages, the same condition being found in the pericardium. Foramen ovale open. All the remaining internal organs were hemorrhagic.

GYNECOLOGY.

UNDER THE CHARGE OF

HENRY C. COE, M.D., M.R.C.S.,
OF NEW YORK.

Sarcoma of the Ovaries.

Theilhaber (*Münchener med. Wochenschrift*, 1893, No. 28) reports a case of round-celled sarcoma of both ovaries, in a woman aged twenty-four, which developed at the beginning of pregnancy, but was not recognized until a week after the patient had aborted (at the third month). She was not operated upon, but died a fortnight later of pleurisy and pericarditis due to a large sarcomatous nodule in the mediastinum. As the patient had not been under constant observation, it was impossible to determine positively whether the nodule was a primary or secondary growth. Sarcoma of the ovary is quite rare (forming 0.016 per cent. of ovarian neoplasms according to Schröder), and is found most frequently in young subjects. The prognosis after removal is unfavorable.

Obturator Hernia containing the Tube and Ovary.

Rogner-Gussenthal (*Wiener med. Presse*, 1893, No. 26) reports a rare case of incarcerated obturator hernia in a patient sixty-six years old, which terminated fatally on the fifth day after operation. At the autopsy it was found that the hernial sac contained the right broad ligament with the tube and ovary, the uterus being drawn over to the obturator foramen. The condition had probably existed for twenty-six years, the history showing that incarceration had occurred on previous occasions. The event showed that a median incision in Trendelenburg's posture would have been preferable to the inguinal operation which was performed. Only three similar cases have been reported.

Abdominal Section in Cases of Vesico-vaginal Fistula.

Von Dittel (*Wiener klin. Wochenschrift*, 1893, No. 25) after reviewing the history of the operation describes his technique in the case of a difficult fistula. With the patient in Trendelenburg's posture, he made a median incision extending from the umbilicus to the symphysis pubis, seized the fundus with a volsella and drew the organ upward and backward. While one assistant elevated the uterus, another pressed the bladder upward and against the symphysis, keeping the organ on the stretch. The vesico-uterine fold of peritoneum was then incised transversely, and the bladder was peeled off (as in abdominal hysterectomy) as low as the portio, until the fistula was thoroughly exposed; the edges of the latter were then denuded, and the opening was closed with fifteen interrupted sutures. The ureters were not disturbed. A drainage-tube was passed through into the vagina, and the abdominal wound was closed with a strip of gauze inserted at its lower angle behind the

symphysis. Recovery was prompt, but in consequence of the obstinacy of the patient the fistula did not close completely.

In order to avoid the danger of urine escaping into the peritoneal cavity, the writer advises that the bladder be empty at the time of the operation. If the uterus is drawn forcibly upward, all the urine will escape *per vaginam*, and in any case the wound can be thoroughly protected with gauze pads. He would only apply the abdominal operation to cases of long standing in which the fistula is inaccessible *per vaginam*.

Conservative Operations on the Uterus and Adnexa.

Martin (*Deutsche med. Wochenschrift*, 1893, No. 30) reports twenty-seven cases of resection of one ovary after removal of the other, with one death, eight of the patients subsequently becoming pregnant. In forty operations for resection of atretic tubes, after extirpation of the opposite one, he had three deaths, one patient conceiving. Twenty-six patients died in one hundred and forty-one operations for the enucleation of interstitial fibro-myomata of the uterus; there was no death in the last twenty. Two women subsequently conceived.

As the result of his experience, the writer believes that conservative are no more dangerous than radical operations; that the patients are nearly always relieved of their symptoms, while the functions of the preserved organs are maintained, so that pregnancy is possible, while labor is not attended with especial risks.

Ovariotomy without Chloroform.

Layeau (*Annales de Gynécol. et d'Obstét.*, May, 1893) reports a case of double ovariotomy upon a patient who had such serious cardiac trouble that it was deemed unwise to administer an anæsthetic. Local anæsthesia along the line of the incision was maintained by a spray of chloric ether. The writer has demonstrated the possibility of operating in this manner in two other cases of renal and cardiac trouble—one operation being an abdominal hysterectomy, the other a difficult ovariotomy.

Treatment of Uterine Fibroids.

This subject seems to be attracting the chief attention of gynecologists at present, judging by the space allotted to it in various society discussions. The following views were expressed at the recent French Surgical Congress:

Köberlé: Fibroids are essentially benign in character, but may become dangerous in the process of evolution. Tumors impacted in the pelvis constitute a real indication for operative interference. Intra-uterine fibromata, giving rise to excesive hemorrhage, require an operation whatever may be the age of the patient. Large firm tumors which are stationary should not be interfered with, especially if the patient is near the climacteric. An operation is rarely indicated in the case of sub-peritoneal growths attached to the fundus uteri, since they seldom threaten life. In performing hysterectomy, the speaker stated that he had always used clamps in securing the broad ligaments, having first employed them in 1865.

PÉAN: Fibroids are not such benign growths as has been supposed. Sarcomatous degeneration and coexisting epithelioma are to be feared, as well as degenerative changes and resulting septic infection. The dangers of pregnancy in this connection are many and serious. The speaker has noted intestinal obstruction, renal complications, and various abnormal conditions of the adnexa, as well as peritonitis and hemorrhage. In the majority of his cases the tubes and ovaries were found to be diseased. His results were as follows: In two hundred cases of abdominal hysterectomy (1868 to 1893), his mortality was 15 per cent., in fifty combined operations 2 per cent., while in three hundred vaginal hysterectomies for fibroid tumors (performed between 1882 and 1893) the mortality was only 2 per cent. The speaker attributes much of his success to the use of clamps and removal of the tumor piecemeal.

BOUILLY: Hemorrhage and pain are indications for castration, since disease of the adnexa exaggerates most of the symptoms due to the presence of the tumor. In the speaker's experience, pain and hemorrhage ceased in 70 per cent. of the patients upon whom he operated.

POZZI: Vaginal hysterectomy is preferable to castration; the latter operation should be reserved for cases in which the patient is too weak to submit to total extirpation, or where the tumor is very large and is within the folds of the broad ligament. Removal of the adnexa does not eliminate pressure symptoms.

CONDAMIN recommends intra-uterine applications of chloride of zinc in the case of fibroids which cause hemorrhage only, when the patient is near the menopause, or is too weak to undergo an operation. Cauterization gives more permanent results than curettage. Stenosis of the cervix is avoided by dilating thoroughly, introducing a pencil of zinc into the uterine cavity, and then tamponing the cervix tightly with gauze.

DELAGÉNIÈRE: Abdominal hysterectomy should be elected in the case of all tumors that extend to the umbilicus, while castration is preferable for small tumors in young women, when hemorrhage is the principal symptom. Small submucous fibroids may be enucleated; vaginal hysterectomy should, however be preferred if the uterine cavity is deep and irregular and difficult to drain. In all other cases total abdominal hysterectomy is indicated.

CHRONIC OÖPHORITIS.

WINTERNITZ (abstract of monograph in *Centralblatt für Gynäkologie*, 1893, No. 31) gives the results of his studies on this subject, extending over a period of ten years at the Tübingen clinic, where he estimates the affection as comprising ten and one-half per cent. of all gynecological cases.

As regards etiology, he finds that the principal factors are injuries during menstruation, puerperal troubles, gonorrhœa, masturbation, and infectious diseases.

The following anatomical changes were noted: Thickening of the cortex with connective-tissue hyperplasia of the parenchyma, disappearance of the follicles, hyaline degeneration of the intima of the vessels, or obliterating endarteritis. Round-cell infiltration was rarely present as in true inflammation of the ovary.

As regards palliative treatment, improvement is rarely, a cure almost

never obtained. Oöphorectomy, however, should be regarded as the last resort, and is indicated only in cases of excessive menorrhagia, or rarely in those patients who have been treated for a long time without benefit, and "when nervous symptoms are absent."

The Buried Wire Suture in Cœliotomy.

Schede (abstract of monograph in *Centralblatt für Gynäkologie*, 1893, No. 31) has buried his wire sutures in 151 cœliotomies, in the majority of which there was risk of the subsequent development of ventral hernia. Small herniæ occurred in only seven cases, in which it was necessary to remove the wires prematurely on account of pain or mural abscesses. His technique is as follows: Strong silver-wire sutures are first passed through the entire thickness of the abdominal wall, but are not twisted. While an assistant approximates the edges of the wound, the operator introduces three or four silver sutures through the sheath of the rectus and the peritoneum only. While the fascial edges are approximated with forceps, the latter sutures are twisted, then the deep sutures. A small strip of gauze is applied over the external wound, and covered with cotton saturated with collodion. The deep sutures are removed on the tenth day and the patient is allowed to go about without an abdominal bandage.

Vagino-fixation of the Uterus.

Mackenrodt (*Centralblatt für Gynäkologie*, 1893, No. 29) refers to the fact that Winter recently reported fourteen cases of vagino-fixation performed according to his (Mackenrodt's) method, all of which were unsuccessful, and attributes the bad result to wrong technique. The writer insists upon the importance of the following steps: A median incision is first made in the anterior vaginal wall, extending from the portio to the most prominent part of the urethro-vaginal septum, and the flaps are dissected off laterally. The cervix is then grasped with the bullet forceps and is drawn forcibly downward, while the urethral prominence is drawn upward. The bladder is dissected away from the uterus as high as the vesico-uterine fold of peritoneum. The vaginal flaps are now held apart, and a curved transverse incision is made in the vesico-vaginal septum at the lower angle of the wound. A sound is passed into the uterus, and the organ is anteverted, the peritoneum being stripped from the fundus of the bladder sufficiently. The raw surface on the protruding portion of the bladder is now closed with a continuous suture, not only to check oozing and to prevent the formation of a pocket between the uterus, vagina, and bladder, but to approximate the point of fixation of the fundus uteri to the symphysis. If prolapsus exists, the vagina is narrowed by excising the flaps made, and suturing. The final step in the operation consists in fixing the fundus uteri by passing two silk sutures first through the outer edges of the vaginal wound just below the urethral prominence, then into the corpus uteri as high up as possible, and the vesico-uterine pouch, then downward across the vaginal wound so as to emerge at a point an inch lower on the opposite side. The sutures being tied, form a cross. The remainder of the vaginal wound is then closed with catgut sutures, and is at the same time united to the cervix. The silk sutures are left *in situ* from six to eight weeks. The

fixation of the uterus is obtained through union of the opposed folds of the vesico-uterine pouch. Slight flexion of the uterus is maintained by the crossing of the sutures. If the cervix is very long, it is amputated.

The writer has performed this operation thirty-one times; thirteen cases were entirely successful, three women subsequently becoming pregnant, one twice. Six women in all afterward became pregnant; three were delivered spontaneously and one with forceps, the uterus remaining in the former position after involution had taken place.

DÜHRSSEN (*Centralblatt für Gynäkologie*, 1893, No. 30) in a lengthy paper discusses Mackenrodt's operation, which, he says, is essentially the same as the one previously described by himself, with the exception of the first step—splitting the anterior vaginal wall—which is superfluous, as well as suturing the lower portion of the bladder and attaching the vaginal flaps to the cervix. Moreover, there is the risk not only of wounding the bladder and causing a fistula or of actually contracting the viscus, but of forming a dangerous pocket between the bladder and the vagina. In his own operation (which can be completed in from ten to fifteen minutes) the writer simply opens the anterior fornix, pushes the bladder toward the symphysis with catheter and forefinger, while the cervix uteri is drawn downward and backward, and by means of temporary sutures gradually draws down the uterus until permanent sutures can be passed through the vesico-uterine pouch and fundus. The patient need be kept in bed only a week. This operation he has performed forty times with perfect success.

STEINBÜCHEL (*Centralblatt für Gynäkologie*, 1893, No. 31) reports four cases of vagino-fixation, performed according to Mackenrodt's method, the results of which were quite satisfactory. The operation was modified by prolonging the median vaginal incision downward, and making an oval denudation when the vagina was much relaxed. Moreover, the peritoneum was dissected away from the fundus as far as possible, so that the sutures could be passed into it higher up. When these were fastened to the lower edges of the vaginal wound, prolapse of the bladder was prevented, and the uterus was firmly fixed in the desired position. Additional sutures were then passed through the uterus, thus bringing the anterior raw surface of the organ more directly in contact with the vaginal wound than in the original operation.

THE PALLIATIVE TREATMENT OF CARCINOMA OF THE CERVIX UTERI.

SÄNGER (*Schmidt's Jahrbuch*, Bd. ccxxxvii. p. 88) calls attention to the fact that Carl von Braun, before the days of total extirpation, succeeded in permanently curing 20 per cent. of his cases by amputating the cervix with the galvano-cautery loop, while Winter has shown that the results after extirpation are only 5 per cent. better. Only one-fourth of the whole number of patients who consult gynecologists are still in an operable condition; in those in which the disease has invaded the vesico-vaginal septum and the peri-uterine tissues palliative treatment alone is justifiable. This consists in curettage followed by cauterization with the Paquelin, and, after the slough has come away, applications of solutions of chloride of zinc (fifty to thirty per cent.). The writer separates the remains of the cervix as high as the peritoneum anteriorly and posteriorly and the bases of the broad ligaments

laterally before removing the diseased tissue, tying any spurting vessels. The cervical canal is thoroughly cauterized. At the end of two weeks the chloride of zinc is applied several times. In one case of inoperable carcinoma thus treated there was no recurrence in nearly three years. In only one case out of five has there been a recurrence.

Hemorrhagic Necrosis of the Fallopian Tube.

Sänger (*Centralblatt für Gynäkologie*, 1893, No. 31) describes under this term a comparatively frequent condition in which hemorrhage into the tube occurs as the result of torsion of the pedicle of an ovarian cyst, sometimes also in hernia of the tube. The writer reports a case of double salpingitis in which he performed cœliotomy, finding the left tube so compressed and twisted by surrounding adhesions that the tubal wall was filled with blood-infarcts that had undergone necrosis. There were no thromboses in the veins of the mesosalpinx. Clinically the sudden enlargement of a tube which is known to be the seat of chronic disease, associated with pain and other evidences of peritoneal irritation, but without accompanying fever, should arouse the suspicion that such hemorrhage has taken place.

Primary Epithelioma of the Fallopian Tube.

Routier (*Bull. et Mém. de la Soc. de Chir. de Paris*, 1893, No. 1) reports a case of this rare affection, the specimen being removed by cœliotomy. The tube was enlarged to the size of a coil of small intestine, and had a smooth symmetrical outline. The distal end formed a cyst the size of an orange; the corresponding ovary could not be found. The tube, as well as the cyst, was filled with a thick, fibrinous mass, unlike the contents found in chronic salpingitis. Under the microscope the muscular wall did not appear to be hypertrophied, though the submucosa was thickened and contained large alveoli of connective tissue filled with epithelial cells, some flat and others cylindrical, with multiple nuclei.

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